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ABSTRACT

This book builds on Volume 1 of "Reaching Potentials," which attempted to operationalize the "Guidelines for Appropriate Curriculum Content and Assessment" set by the National Association for the Education of Young Children (NAEYC) and the National Association of Early Childhood Specialists in State Departments of Education (NAECS/SDE). Volume 2 elaborates on the guidelines, including describing what content is of most worth, what content goals are accepted by educators and have the greatest intellectual integrity, what content goals are the most reasonable and attainable. This volume's purpose is to describe curriculum content by subject matter, focusing on ages 3-8. Each chapter takes current views of curriculum content exemplified in national standards and places them in developmental perspective. For each content area various perspectives regarding curriculum planning are covered. Emphasis is given to conveying important knowledge specific to a discipline and to considering how and when children develop and learn. The chapters are the following: (1) "Introduction" (Sue Bredekamp; Teresa Rosegrant); (2) "Reaching Potentials Through National Standards: Panacea or Pipe Dream?" (Sue Bredekamp; Teresa Rosegrant); (3) "Reaching Potentials Through Transforming Curriculum, Assessment, and Teaching" (Sue Bredekamp; Teresa Rosegrant); (4) "Transforming Mathematics Curriculum" (Kathy Richardson; Leslie Salkeld); (5) "Transforming Science Curriculum" (Sally J. Kilmer; Helenmarie Hofman); (6) "Transforming Health Curriculum" (Charlotte Hendricks; Connie Jo Smith); (7) "Transforming Curriculum in the Visual Arts" (Christine Marme Thompson); (8) "Transforming Curriculum in Music" (Barbara Andress); (9) "Transforming Curriculum in Social Studies" (Carol Seefeldt); (10) "Transforming Physical Education Curriculum" (David L. Gallahue); (11) "Transforming Curriculum in Language and Literacy" (Kathryn F. Whitmore; Yetta Goodman); and (12) "Transforming Curriculum Organization" (Sue Bredekamp; Teresa Rosegrant). (BGC)

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# Reaching Potentials:

## Transforming Early Childhood Curriculum and Assessment

Volume 2

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# Reaching Potentials:

## Transforming Early Childhood Curriculum and Assessment

Volume 2

Sue Bredekamp and Teresa Rosegrant, Editors

National Association for the Education of Young Children—Washington, DC

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# 1

# Reaching Potentials through Transforming Curriculum: Introduction

*Sue Bredekamp and Teresa Rosegrant*

## Where we've been

In the years since Volume 1 of *Reaching Potentials* was published, we have learned a great deal. Perhaps the most important lesson we learned was never to publish a Volume 1 unless Volume 2 is already complete, especially if the topic is as dynamic as curriculum and assessment. Ironically, at the time Volume 1 was published in 1992, a draft of Volume 2 had already been written but quickly became dated. Unfortunately, the authors' work predated by a very short time what was to become a major transformation in curriculum sparked by the national standards movement that was stimulated by the promulgation of National Education Goals (National Education Goals Panel 1991). To illustrate the breadth and speed of this movement, when Volume 1 was published, mathematics was the only curriculum area with national standards (National Council of Teachers of Mathematics 1989); by mid-1995, all of the curriculum areas addressed in this book had developed national standards except language arts, which is circulating a nearly final draft of its standards (Miriam T. Chaplin, National Council of Teachers of English, personal communication with authors, 24 October 1995).

Volume 1 served as a support document for interpreting and applying the *Guidelines for Appropriate Curriculum and Assessment in Programs Serving Children Ages 3 Through 8*, developed by NAEYC and the National Association of Early Childhood Specialists in State Departments of Education. (See NAEYC & NAECS/SDE 1992 for the complete position statement, and pp. 16–17 of this book for the guidelines.) Volume 2 builds on Volume 1 by elaborating several of the curriculum guidelines, specifically by describing what content is of most worth, what content goals are accepted by educators in the disciplines and have the greatest intellectual integrity, and what content goals are realistic and attainable for children of different ages.

## Where we want to go

The purpose of Volume 2 is to describe the content of the curriculum by subject matter across the age span of early childhood, with focus on ages 3 through 8; most chapters also identify content-specific learning that occurs during infancy and toddlerhood (space constraints did not permit separate chapters on infants and toddlers as we had planned). Each chapter takes the current thinking about curriculum content as exemplified in the national standards of a specific content area (if available) and places it in developmental perspective, as well as commenting on its applicability to preschool-age children.

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Another purpose of this book is to critically consider the standards movement and its potential for strengthening the early childhood curriculum, as well as the possible negative effects of national standards. In Chapter 2 of this book we take a critical look at these issues.

Dividing the curriculum by subject or discipline always opens up criticism that such a traditional approach is counter to one of the most important trends in education—and one of our own curriculum guidelines—integrated curriculum. After all, integrated curriculum is not an educational fad but an approach that better reflects how children learn by stressing meaningful connections across subject-matter disciplines. How can we promote curriculum integration, on one hand, while perpetuating the subject-matter divisions in our organization of this book? In short, we believe that integrated curriculum cannot achieve intellectual integrity unless it is thoroughly grounded in the knowledge bases of the various disciplines, which have evolved over centuries. Separate disciplines exist for a reason. They define branches of knowledge, provide systems for designing and organizing knowledge, and provide key concepts, tools of inquiry, and perspectives on understanding the social, physical, and biological world. Gardner and Boix-Mansilla "find students' access to these disciplinary tools to be an indispensable ingredient of quality education. Shorn of disciplines we become intellectual barbarians" (1994, 198).

Successfully planning integrated curriculum is possible only after the educator acquires initial understanding of the commonalities and differences among the disciplines, an understanding from which meaningful and important attempts at integration can be made. Without foundation in the disciplines, "integrated" curriculum in early childhood can too quickly degenerate into fun but meaningless activities or trivial pursuits. Achieving integrated curriculum that also has intellectual integrity is the key challenge. As we quickly learned when trying to assemble this book, educators from every discipline almost instinctively resist too much integration of content for fear that the integrity of their discipline will disappear. A more complete discussion of the challenge of integrating curriculum concludes this book.

## Overview of the book

To thoroughly address the content of the curriculum, at a minimum we would need to describe for each content area all the various perspectives that inform curriculum planning (see Bredekamp & Rosegrant 1992, 68–73). For the purpose of this discussion, we emphasize two criteria of sound curriculum: (1) conveying important knowledge from a given discipline in meaningful ways, and (2) considering how and when children develop and learn. The knowledge and structure of the subject-matter disciplines (science, social studies, mathematics, language arts, health, physical education, music, and visual art) provide the content. For children, this knowledge becomes meaningful and relevant when teachers use conceptual organizers or other integrated approaches, such as themes, units, or projects. Decisions about what to teach and when must be informed by knowledge of child development and learning. This knowledge includes normative information relevant to the cognitive, socioemotional, and physical domains and its implications for making curriculum age appropriate. Equally important, such knowledge includes the con-

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tinuum of development and learning of the children in the group, within which teachers identify children's individual needs and interests for the purpose of adapting curriculum and instruction to ensure that they are individually appropriate. These perspectives and their implications for curriculum development are described in more detail in Chapter 3.

As we read the eight chapters addressing each discipline, we (the editors) discovered intriguing differences between the chapters. The chapter authors, working within prescribed space limitations and influenced, at least in some cases, by the nature of their disciplines' standards, produced chapters focused in one of two ways. The focus of the chapters on mathematics, science, and health education is relating national curriculum standards to conceptual organizers or other meaning-centered strategies for organizing curriculum. The focus of the remaining discipline chapters is on knowledge of child development and learning. The chapters on social studies (history, civics, and geography), the visual arts, and music analyze the respective national standards in light of general knowledge about child development and learning. The chapters on language and literacy and on physical education describe the continuum of development and learning in these disciplines.

This book is not a curriculum, nor is it even a curriculum guide, many fine examples of which are available and referenced herein. Instead, this book is intended to provide early childhood teachers and curriculum developers with some conceptual frameworks from which to organize the vast subject of curriculum content. Even a quick perusal of the voluminous sets of national curriculum standards indicates that some connections must be made between them or the curriculum will literally sink from its own weight, drowning the teachers and children with it.

Volume 2 is intended as a companion piece to Volume 1, in which several important topics are discussed in greater detail than space permits here. These topics include in-depth descriptions of appropriate assessment strategies; adaptation of curriculum and assessment practices for children with special needs; and more thorough discussions of the issues of cultural and linguistic diversity. Volume 1 also provides a framework for curriculum planning (Chapter 6, 76–91) in which the discipline standards can be easily applied; this planning framework promotes important dispositions toward learning in children, such as persistence, focused participation, hypothesis testing, risk taking, and self-regulation (described in Volume 1, 74–76).

## Now to begin

Curriculum can be thought of in two very different ways. On one hand, it is a constantly moving target; as new knowledge is acquired or as community values change, curriculum is dynamic, always changing. On the other hand, in some ways curriculum is a dinosaur that keeps growing bigger but fails to evolve at all; for example, most anyone can predict what young children across America will be "learning" about on February 14 or March 17. The national standards movement reflects both of these extreme views on curriculum. For example, the curriculum and assessment standards of the National Council of Teachers of Mathematics (1989) have in many ways transformed mathematics learning in this country; NCTM

was truly on the cutting edge by setting standards that they estimated fewer than 10% of school districts could meet at the time. Unfortunately, the very fact that every other group of subject-matter experts leaped into the standards fray with nothing like the 10 years of development work NCTM invested is only one indication of how disciplines tend to defend their own turf. Unlike the math teachers, whose standards are a model of parsimony, too many groups responded by producing unwieldy lists of learning objectives (as though standard setting were a contest between groups to see whose set is biggest). Not surprisingly, the quality represented by the different sets of national standards ranges from state-of-the-art to status quo.

Throughout this book, excerpts of national standards are reprinted with permission. With the exception of these cited position statements, *the chapters in this book do not present official positions of national organizations; they are the opinions of the authors.* We wish to thank all of the authors for their considerable patience during the delay in publishing this book. We especially wish to thank Kathy Whitmore, whose chapter—first written so long ago—gave us the conceptual organizer for these books: reaching potentials. We present Volume 2 in hopes that by deeply thinking about the content we teach young children, we will truly transform curriculum and do a better job of helping all children reach their potentials as learners and as citizens of our democratic society.

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# 2

# Reaching Potentials through National Standards: Panacea or Pipe Dream?

*Sue Bredekamp and Teresa Rosegrant*

Framing a book on curriculum content around the national curriculum standards is somewhat risky. The national standards movement is in its infancy and continues to be surrounded by considerable controversy (see *Phi Delta Kappan,* June 1995, special section on Standards; and *Educational Leadership,* March 1995, special section on New Standards for Learning). Despite these cautions, the national standards movement holds tremendous potential to transform curriculum and assessment in this country, perhaps as much potential as any other educational reform of the last several decades. Unlike other efforts at reform, such as restructuring, changing graduation requirements, or certifying teachers, the standards movement directly targets teaching and learning in schools. Standards are the long answer to the short question, What do children need to know and be able to do? Answering that question has enormous implications for what is taught, when it is taught, how it is taught, and how learning is assessed.

Because all educational reforms—no matter what age group they are directed toward—tend to trickle downward, early childhood educators must be active players in the national standards efforts. It is unrealistic for early childhood education to establish another set of standards for its constituents, in part because all of the existing standards begin at least as early as children of kindergarten age, and some address younger age groups. Instead of recommending yet another expensive standard-setting project, early childhood educators should assume responsibility for evaluating and applying the existing standards to young children.

The purpose of this chapter is to take a critical look at the concept of national curriculum standards, both the advantages and disadvantages of standards in general. We begin with a brief history of the standards movement. Next we turn to a discussion of the criteria for evaluating standards. Then we explore the advantages and disadvantages of national curriculum standards in the various subject-matter disciplines, followed by a discussion of the issues as they pertain to development of state standards. Analyzing standard setting from the perspective of states is an essential step in this exercise because our educational system has been and undoubtedly will continue to be under state and local jurisdiction. The National Education Goals Panel (Goals 3 and 4 Technical Planning Group 1993) is careful to point out that national standards are voluntary and do not constitute a national curriculum. Finally, we attempt to make direct connections between Goals 1 and 3 of the National Education Goals, both of which have implications for early childhood education.

## Where did the standards movement come from?

The current flurry of activity surrounding national curriculum standards is almost entirely an outgrowth of the National Education Goals, developed in 1989 by President Bush and a cadre of governors, chaired by then-Governor Bill Clinton. The six original goals were announced in 1990, and the National Education Goals Panel was established in 1991 to measure progress toward these goals, with plans to release an annual report card each fall during the 1990s. The six goals were expanded to eight and written into legislation as Goals 2000 under the Clinton administration.

Goals 3 and 4 most directly precipitated the standard-setting frenzy. Goal 3 states,

> By the year 2000, American students will leave grades four, eight, and twelve having demonstrated competency in challenging subject matter, including English, mathematics, science, history, and geography; and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our economy. (Goals 3 and 4 Technical Planning Group 1993, 4)

Goal 4 reinforces Goal 3 by establishing that

> By the year 2000, U.S. students will be first in the world in science and mathematics achievement. (p. 4)

Goal 3 concerns early childhood educators because the first proposed measurement of student progress is fourth grade, thus potentially creating considerable pressure throughout the primary grades. In addition, early childhood educators have found particular parochial interest in Goal 1—"By the year 2000, all children will start school ready to learn." The "standards" that define achievement of this goal—i.e., how do we know a child is "ready to learn"—are, in effect, the outcomes expected of preschool education programs, a more thorough discussion of which concludes this chapter.

When Goals 3 and 4 were written, mathematics was the only discipline that had established national curriculum standards (NCTM 1989). The math teachers had worked for a decade to develop a truly cutting-edge set of standards that address both content and process (what and how to teach) and that reflect current views of children's construction of knowledge. The NCTM standards, as a result, were endorsed or supported by 40 educational organizations, including NAEYC.

The need to define high academic standards for the other discipline areas precipitated considerable activity, much of which was supported by federal grants. Two related trends occurred as a result. Disciplines that were left out of Goal 3 began to jockey for inclusion on the justifiable grounds that their already slim portions of the curriculum pie would be further reduced as a result of national goals. For instance, a consortium of fine-arts groups, including visual arts, music, theater, and dance (Consortium of National Arts Education Associations 1994), quickly moved to develop and actively promote national standards in their subject areas. Foreign languages, physical education, and health education followed. Likewise, competition ensued even within the favored disciplines, with several sets of science standards and competing social studies frameworks. This situation created the need to develop standards for standards (standards squared, so to speak) and decide which standards meet the standards. A group was proposed, the National Education Standards and Improvement Council (NESIC), that would certify one set of standards in each subject-matter area, based on criteria developed by the Goals 3 and 4 Technical Planning Group on the Review of Education Standards (1993).

No sooner had this "sweeping reform" begun than it was politically challenged by the new Republican-majority Congress elected in November 1994. Although the national standards movement began under a Republican president, with bipartisan support from governors precipitated by the need to hold teachers and children accountable for public funds, the movement ironically became the target of a conservative backlash fomented by the religious right. Local and state political leaders and parents became alarmed that the national standards were another name for the vilified "outcome-based education," which they perceived as values education of the most liberal bent (Burron 1994; Cohen 1995). They also saw Goals 2000 and national standards as a veiled attempt to wrest control of education away from parents and local districts and place it within the federal bureaucracy, with NESIC especially identified as Big Brother.

The controversy over national standards spans the political spectrum. Kenneth Goodman (1994), past president of the International Reading Association, accused the standard-setting movement of being a veiled attack on universal public education. "For those who start out furthest from the standard, in language, culture, or economic means, turning standards into single yardsticks can be devastating. It can wipe out, for Native-Americans, Hispanics, African-Americans, and the poor everywhere, all the gains made since the civil rights era" (Goodman 1994, 39).

Considerable editorializing, much of it unfounded, has occurred around the standards movement, slowing it somewhat, although not derailing it altogether (Cohen

1995). In fact, the politicizing of the national standards movement was manifest in the U.S. Department of Education's removing the grant for development of language arts standards on the grounds that, among other problems, the draft standards were too process oriented (Barth 1995). Certainly, the most obvious manifestation of the role of politics in standard setting was a resolution passed on January 8, 1995, by the Senate, disapproving the U.S. and world history standards by a vote of 99 to 1 (Ravitch 1995).

Equally controversial and politically charged were proposed "opportunity to learn" (OTL) standards. In fact, governors successfully fought such standards in Goals 2000 legislation because they feared that the cost of providing equal opportunity to learn could prove prohibitive. Proponents of OTL standards, such as David Hornbeck, argue that high-stakes content standards require that efforts be made to level the playing field somewhat across schools and districts. In short, content and performance standards "are useless unless students, teachers, and parents have fundamental tools to do the job and work in schools that function within a policy framework that comprehensively encourages rather than inhibits high achievement by students and quality teaching by teachers" (Goals 3 and 4 Technical Planning Group 1993, 30). Hornbeck suggests opportunity-to-learn standards such as

- a process whereby student achievement results would be examined to determine which schools may need assistance;
- professional development rooted in educator standards reasonably calculated to maintain a competent teaching force;
- a system of school/district incentives tied directly to student achievement improvement by all students; and
- policies regarding curriculum and instructional materials that would help students meet performance standards.

A complete history of the standards movement is beyond the scope of this chapter and is well documented elsewhere (Lewis 1995; Council on Basic Education 1994a, 1994b, 1995). Suffice it to say that what began as a purely professional activity designed to upgrade teaching and learning within a select few disciplines has grown to a national effort supported by federal dollars that has subsequently become highly politicized. The movement has yet to gain popular support among the American public, either among those who pay for schooling though tax dollars or those with the greatest vested interest, parents of children in public schools (Cohen 1995). As Cohen points out, the lack of popular appeal of standards may be related to the complexity of the concept. Standards are not simply good or bad; they are potentially good and bad for many different reasons, a few of which we will now explore.

## What are the standards for standards?

When we first started writing this book in 1991, we found it necessary to prepare a standards lexicon because the terminology used in standards was so unclear; words such as *standard, outcome, performance, objective, goal, guideline, criterion,* and others were used interchangeably and rarely defined consistently. The Goals 3 and 4 Technical Planning Group (1993), chaired by Shirley Malcom of the American Association for the Advancement of Science, has since solved much of the confusion with the publication of a helpful document, entitled *Promises to Keep: Creating High Standards for American Students.* This document provides a considerable service by clearly defining the most important terms and concepts related to standard setting; the definitions are helpful in promoting communication about standards.

The recommendations of the Goals 3 and 4 Technical Planning Group (1993) suggest criteria and processes for reviewing two kinds of education standards: content and performance standards.

> **Content standards** specify "what students should know and be able to do." They indicate the knowledge and skills—ways of thinking, working, communicating, reasoning, and investigating, and the most important and enduring ideas, concepts, issues, dilemmas, and knowledge essential to the discipline—that should be taught and learned in school. They help develop the work and learning habits essential to success in the world outside school: studying well, thinking logically, drawing inferences, supporting assertions with evidence, and applying what is known to a new situation. Central to the purposes of schooling, these habits enable students to apply the knowledge and skills they learn in school to problems of the real world. (1993, ii)

The Technical Planning Group's definition of content standards includes both knowledge and skills, or performance, which other groups often separate. They also propose that two types of content standards be developed and potentially approved: national subject-specific content standards (one set in each of eight discipline areas: English, mathematics, science, history, geography, foreign languages, civics, and the arts); and state content standards, because each state would need to integrate the proposed standards into

a feasible but adequate set of meaningful standards, typically a subset of the eight subject-specific standards.

The group also defines performance standards:

> **Performance standards** specify "how good is good enough." They relate to issues of assessment that gauge the degree to which content standards have been attained. While others use the term differently, in this report "performance standards" are not skills, modes of reasoning, and habits mentioned above that assessments attempt to measure. Instead, they are the indices of quality that specify how adept or competent a student demonstration must be. A performance standard indicates both the nature of the evidence (such as an essay, mathematical proof, scientific experiment, project, exam, or combination of these) required to demonstrate that the content standard has been met and the quality of student performance that will be deemed acceptable (that merits a passing or "A" grade). . . . Performance standards are essential to gauging whether content standards are met. (Goals 3 and 4 Technical Planning Group 1993, iii)

The Goals 3 and 4 Technical Planning Group offer 10 criteria for evaluating the worth of subject-specific standards (1993, iii–iv):

1. **World-class,** at least as challenging as current standards in other leading industrial countries, though not necessarily the same;
2. **Important and Focused,** parsimonious while including those elements that represent the most important knowledge and skills within a discipline;
3. **Useful**, developing what is needed for citizenship, employment, and lifelong learning;
4. **Reflective of Broad Consensus Building,** resulting from an iterative process of comment, feedback, and revision including educators and the lay public;
5. **Balanced,** between the competing requirements for:
   - — depth and breadth;
   - — being definite/specific and being flexible/adaptable;
   - — theory or principles and facts or information;
   - — formal knowledge and applications; and
   - — being forward-looking and traditional.
6. **Accurate and Sound,** reflecting the best scholarship within the discipline;
7. **Clear and Usable,** sufficiently clear so that parents, teachers, and students can understand what the standards mean and what the standards require of them;
8. **Accessible,** sufficiently specific so that attainment can be measured in terms meaningful to teachers, students, parents, test makers and users, the public and others.
9. **Adaptable,** permitting flexibility in implementation needed for local control, state and regional variation, and differing individual interests and cultural traditions;
10. **Developmentally Appropriate,** challenging but, with sustained effort, attainable by all students at elementary, middle, and high school levels.

Criteria for evaluating state content standards (Goals 3 and 4 Technical Planning Group 1993) include being

1. As rigorous as national subject-specific standards, and when different, subject to the same review criteria;
2. Feasible, sufficiently delimited and focused so they could be implemented;
3. Cumulatively adequate to give all students the knowledge, skills, and habits needed to succeed in work and further learning;
4. Encouraging of students' ability to integrate and apply knowledge and skills from various subjects;
5. Reflective of broad state consensus-building, resulting from an iterative process of comment, feedback, and revision among educators and the public within the state.

Taken together these criteria are reasonably consistent with the curriculum guidelines developed by NAEYC and NAECS/SDE (1992). Those guidelines are designed to evaluate the appropriateness of curriculum for young children. Given that the standards are expected to have considerable influence on shaping curriculum development, it is especially encouraging to see that standards should be important and focused, integrated, accurate and sound, flexible, adaptable, and developmentally appropriate—goals highly consistent with early childhood curriculum guidelines, a summary of which appears in Chapter 3.

## What are the potential benefits of national standards?

National standards have the potential to serve two very important functions for adults who work with young children. First, they can serve as a beacon to direct curriculum development in general. At their best, standards are visionary, compelling the field to follow toward shared, lofty goals. At the local level, standards can serve almost as flashlights, focusing the direction of teachers and children in classrooms, helping them figure out where they are in relation to where they want to go.

Well-developed national content standards, presumed to conform to both the National Education Goals Panel's criteria as well as NAEYC and NAECS/SDE guidelines, would be advantageous for at least five reasons. They have the potential to provide cur-

riculum with important content, conceptual frameworks, coherence, consistency, and high expectations.

A primary advantage of national standards is that, if they meet the criterion of parsimony, they have the potential to identify the truly important content of each discipline—what is worth knowing. Such decisions, of course, require value judgments at various levels, but certainly the experts in each discipline have a role to play in these judgments.

Also among the advantages of national standards is that they have the potential (far from realized, to date) to provide conceptual frameworks that enhance communication within and across disciplines and among teachers, children, and parents. Conceptual frameworks are ways of organizing complex information that support the development of understanding. We think of conceptual frameworks as a generative grammar, or a coherent but relatively limited set of core understandings that enable individuals to create, construct, and produce a huge number of concepts and to quickly decide whether and how new information relates to what is already known. These core understandings are not core in the sense of being basic but rather in the sense of being dynamic and generative. A generative grammar is similar to a shared dialect that makes communication within groups not just more meaningful but also more efficient. With so many competing disciplines and subspecialties within disciplines, the need for conceptual frameworks to aid the layperson (including the average teacher, as well as students, parents, and the general public) is even greater.

Coherence does not sound like a lofty goal for curriculum, but it is essential when expert-driven disciplines are translated into goals for 4-, 5-, or 6-year-olds that must be accomplished with the support of teachers who are generalists rather than specialists in any discipline. The best national standards, such as the math standards, are clear, even to those of us who are woefully weak in math; their coherence not only guides but educates us.

Consistency is a tremendous advantage that could be achieved with the adoption and widespread use of national standards. Given the local control of U.S. public schools, it is conceivable that current expectations for first-graders vary not only from state to state but from district to district and even between schools within districts. In early childhood programs, which often are private entities that relate to no other hierarchical structure, consistency of goals and experiences is even less likely. Given the transience of the U.S. population, achieving greater consistency of goals and expectations while maintaining variability of individual and cultural experiences could prove highly beneficial, especially for children whose families, often the less economically advantaged, move frequently.

***WELL-DEVELOPED NATIONAL CONTENT STANDARDS HAVE THE POTENTIAL TO PROVIDE CURRICULUM WITH IMPORTANT CONTENT, CONCEPTUAL FRAMEWORKS, COHERENCE, CONSISTENCY, AND HIGH EXPECTATIONS.***

Although it remains unlikely—as well as undesirable—that a formal national curriculum will ever be adopted in the United States, we have had for many years a *de facto* national curriculum, controlled by commercial textbook developers and test publishers. The degree to which these commercial entities are influenced by national standards in the disciplines is the degree to which we can predict even greater consistency across the nation in curriculum and assessment. Such an effect of national standards could prove beneficial, especially when the standards are of the "beacon" variety, such as those for mathematics, whose influence on textbooks and tests is already becoming apparent.

The national standards movement introduced into the public education debate a goal that, sadly, was new and surprising: high expectations for all children. Some of the rhetoric surrounding high expectations sounds strange to early childhood educators, whose work with very young children tends to make them relative optimists regarding the potentials of children. Nevertheless, U.S. educational institutions have traditionally set relatively low standards for most children (basic skills, remember?), especially for children from low-income families or members of minority groups, with high academic achievement reserved for the small percentage of usually affluent, "gifted and talented" students. The national standards movement is in large part motivated by the threat of global economic competition, leading to the need for "world-class" standards. Although global competition should not be the sole motivation for improving early childhood education, the idea of high expectations could benefit young children. Concern over watered-down, boring, trivial curriculum in early childhood programs was partially responsible for the development of NAEYC and NAECS/SDE's curriculum guidelines in the first place. As has been pointed out by others in our field (Katz & Chard 1989; Edwards, Gandini, & Forman 1993; Metz 1995), children are capable of far more intellectually interesting and challenging study than is often recognized. Appropriately, the National

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Education Goals Panel's definition of *developmentally appropriate* is not limited to "achievable" but rather begins with the word *challenging*.

Among the more important contributions of the standards movement is the consensus-building process that is required if they are to truly be national standards. When teachers themselves, parents, and the public are directly involved in setting standards—whether at the national, state, or local levels—these and other potential benefits of standards seem to be more likely achieved (Barth 1994).

When the only existing example of standards development was the math standards, the potential benefits of national standards were easy to identify, and the standards movement seemed not just benign but potentially beneficial. Unfortunately, many of the newly developed standards did not follow the example of the math teachers, and an evaluation of these other standards leads to an awareness of several potential negative effects of proliferating national content standards.

## What are the potential negative effects of national standards?

The good news—that national standards are now established in many curriculum areas—is also the bad news. As always, the disciplines carve out their territory, now by setting standards that establish impossibly competing goals—in terms of number of objectives, level of detail, and time required—for teachers and children to achieve. Jones (1994) says that every species has a distinct way of marking its territory; for instance, dogs urinate to identify their area of dominance, while professionals set standards for essentially the same purpose. Although such competition for space in the curriculum is nothing new, its latest manifestation is to proliferate lengthy lists of standards. Far from identifying only the most important knowledge and skills of a discipline, these unwieldy tomes, if taken seriously by schools, would

lead directly back to rote learning necessary to "cover" rather than "master" the curriculum.

Other potential negative effects of national standards include the threat to both integrated curriculum and emergent curriculum, the risk of expectations becoming standardized without regard for individual and cultural differences, and the danger of establishing inappropriate performance standards. A brief discussion of each of these negative effects follows.

"Dueling disciplines" inevitably leads to competition over time, which undermines the concept of curriculum integration (a more complete discussion of integration versus separation of the subject-matter areas appears in Chapter 12). The prescribed curriculum in most U.S. schools is already bursting at the seams. The only way to add anything meaningful is to thoughtfully address the question of how to successfully integrate it across the disciplines. Unless this conversation occurs soon, the matrix of standards threatens to become so immense as to sink of its own weight. In the past, when "too much" has been asked of educational institutions, they traditionally responded by simplifying or reducing the complex in an attempt to ensure successful learning. "World-class" standards are quickly reduced to least common denominators, and high expectations fail to be achieved.

Just as integrated curriculum is a highly valued principle for early childhood educators, so too is emergent curriculum. Emergent curriculum—in which teachers plan curriculum with emphasis on the ideas and interests that emerge from the daily life of children—is a strong tradition in the best early childhood programs (Jones & Nimmo 1994). Because children learn best in the context of what they find relevant, interesting, and meaningful, teachers should use the standards as a framework of big ideas for planning rather than as a prescription. Prescribed curriculum derived from national standards—what experts have determined children should know and be able to do—may not consider on a daily basis what children find intellectually interesting, meaningful, and motivating and through which they can acquire a great deal of specific knowledge and skill. In short, one of the biggest risks of national standards is standardization of curriculum that, by definition, is not responsive to individual needs and interests or to geographic and cultural variation.

The greatest potential problem in the national standards is what they do not say about how expectations vary across the age groups they address. For example, virtually all of the standards list outcomes to be achieved by an end point, usually designated as fourth grade or, sometimes, second grade. The standards are usually silent on how a particular standard should be addressed for younger children. Yet with our country's history of "pushed-down curriculum" (i.e., what used to be taught in first or second grade is now taught in kindergarten), early childhood educators must be wary of how the standards will be applied. In fact, one of the primary purposes of this book is to begin a dialogue about how to apply the various national standards across the age span, a topic that is discussed in more detail in Chapter 3.

Of particular concern to early childhood educators is the assumption inherent in the criteria of the National Education Goals Panel that content can somehow be separated from the process of learning. Recall that the group working on language arts standards lost its federal funding because of their offense of being too "process oriented." Given that reading and writing are processes (and processes are inherent in every other discipline, as well), the pristine notion of separating content and process seems artificial, at best. Nevertheless, the Goals Panel seeks to stay well above the fray of arguments over how to teach, especially between advocates of whole language and advocates of phonics. But—for early childhood, at least—distinguishing content and process (what and how to teach) is not only unfeasible but also undesirable. Evidence suggests, for example, that it is possible to teach basic academic skills to 4- and 5-year-old children in ways that severely undermine their motivation to learn and their attitudes toward school (Stipek et al. 1995), that increase stress (Hyson, Hirsh-Pasek, & Rescoria 1990; Hirsh-Pasek 1991), and that may have other long-term negative consequences (Schweinhart, Weikart, & Larner 1986).

Given the focus in the content standards on what to teach, with no attention given to how children learn and how best to teach, more attention must be paid to the development of performance standards. We know from a great deal of experience that what is assessed and how it is assessed has a major impact on what is

***POTENTIAL NEGATIVE EFFECTS OF NATIONAL STANDARDS INCLUDE THE THREAT TO BOTH INTEGRATED CURRICULUM AND EMERGENT CURRICULUM, THE RISK OF EXPECTATIONS BECOMING STANDARDIZED WITHOUT REGARD FOR INDIVIDUAL AND CULTURAL DIFFERENCES, AND THE DANGER OF ESTABLISHING INAPPROPRIATE PERFORMANCE STANDARDS.***

taught and how. The biggest unknown and, at the same time, the biggest potential danger of national standards lies in the area of performance standards. The performance standards will determine how good is good enough and will also specify how performance will be assessed. Given the justifiable concern about inappropriate assessment of young children (Kamii 1990; Hills 1992; NAEYC & NAECS/SDE 1992; Shepard 1994), close attention must be paid to the development of performance standards.

To date, most of the disciplines have not yet tackled the challenge of setting performance standards; however, a perusal of the few exceptions raises some concerns. For example, the fine arts standards (for which performance standards make immediate sense, given the nature of the disciplines) include performances in some areas that would not only be beyond the capacity of most children but could have a negative impact on the way art is taught. Expecting young children to place great works of art in chronological order by their historical period seems unlikely to enhance children's appreciation of art and shows no respect for children's typical development of concepts of historic time (Consortium of National Arts Education Associations 1994, 34). The type of "performance" required also must be carefully evaluated. For instance, one of the physical education performance standards tests kindergartners by requiring them to draw a circle around a picture of a person throwing overhand or underhand (NASPE 1995, 7), a somewhat strange way of assessing performance for a discipline such as physical education.

It is too soon to make judgments about the potential negative effects of performance standards that have not yet been written. Nevertheless, we can predict that well-developed, admirable content standards will succeed or fail on the basis of the performance standards that follow. Voices of early childhood educators, especially those with particular disciplinary expertise and involvement in the subject-matter organizations, must be heard in the debate. Fortunately, thoughtful people throughout the country are working hard to tackle some of these tough issues. Among the most important projects currently under way is New Standards, headed by Lauren Resnick of the University of Pittsburgh (Resnick & Nolan 1995). New Standards seeks to set performance standards and ways of demonstrating learning, including work samples and commentaries for a subset of the national standards in English language arts, mathematics, science, and applied learning for fourth, eighth, and twelfth grades. Applied learning is an area that cuts across disciplines in an attempt to measure children's performance in more "real-life," workplace competencies, such as problem solving. Participants in and potential consumers of the New Standards include 17 states and several school districts, whose work is expected to be completed in 1996. This project is one example of the work that is being done at the state level to set curriculum standards, a discussion of which follows.

***BECAUSE STATE STANDARDS ARE HIGHER STAKES THAN NATIONAL STANDARDS, THEY REQUIRE EVEN MORE CAREFUL EVALUATION AND SCRUTINY AGAINST GUIDELINES SET BY THE EARLY CHILDHOOD PROFESSION.***

## What lessons can we learn from state standard setting?

National standards are, by definition, removed from the people who are most directly affected. While national standards provide common understandings across our large continent and are, therefore, beacons, states have something unique to offer in the standard-setting arena—their standards are more like flashlights that guide the way of individual teachers and students on a daily basis. States are compelled to be pragmatic because the standards they set drive curriculum and assessment practices in a very direct way. It is performance on state standards that is high stakes, with the potential for directly influencing factors such as merit pay for teachers, funding and control of schools and districts, and individual children's futures. Because state standards are higher stakes than national standards, they require even more careful evaluation and scrutiny against guidelines set by the early childhood profession.

Several states have done exemplary work in developing curriculum guides and/or standards for early childhood. The California curriculum frameworks predated the national standards movement and were especially influential in informing that work. California continued its leadership in educational reform by promoting "the thinking curriculum in the elementary school" (California Department of Education 1992). Among the best curriculum guides available are the *Ohio Early Childhood Curriculum Guide* (Ohio Department of Education 1991) and the *Primary Program:*

*Growing and Learning in the Heartland*, a joint project of the Nebraska and Iowa Departments of Education (1993), based on an outstanding model developed by the Ministry of Education of British Columbia, Canada. Texas Education Agency's *First Impressions* (1994) is another example of a framework to guide early childhood education in the right direction.

In the area of standard setting, several states have led the way. Minnesota developed Model Learner Outcomes several years ago for the full range of birth through age 8 (Minnesota Department of Education 1990). Maryland, a state that is quickly moving to a high-stakes, performance-based assessment system, developed an outstanding framework for early childhood education (Maryland Commission on the Early Learning Years 1992). Another leader in performance assessment, Vermont, likewise has tackled the task of establishing important and meaningful performance standards for early childhood (Vermont Department of Education n.d.).

But such positive examples should not lead to complacency on the part of early childhood advocates. In 1995, Virginia proposed standards for early childhood social studies that, if implemented, would prove impossible for most young children to achieve (for example, demonstrating mastery of "north, south, east, and west" in kindergarten) and would also bring about curricular anomalies such as requiring study of ancient civilizations in the primary grades, which would make meaningful learning unlikely.

## What connections can be made between Goal 1 and Goal 3?

In their Curriculum and Assessment Guidelines, NAEYC and NAECS/SDE (1992) described the challenge of addressing the wide age range of 3- through 8-year-olds, during which the curriculum usually shifts from being almost totally child-centered to being so heavily content-centered that the child essentially disappears. In that document, we call for correction at both ends of the continuum (Bredekamp & Rosegrant 1992, 3)—the need to correct the "early childhood error" (inadequate attention to the content of the curriculum in preschool programs) and the "elementary error" (overattention to curriculum objectives, with less attention to the developmental characteristics of young learners or the specific needs and interests of individual children).

Goal 1 of the National Education Goals ("By the year 2000, all children will start school ready to learn") has been operationally defined in "whole-child" terms, using five dimensions of early development and learning: physical well-being and motor development, social and emotional development, approaches to learning, language development, and cognition and general knowledge (Goal 3 and 4 Technical Planning Group 1993). Each of these dimensions is elaborated in another Goals Panel document, *Reconsidering Children's Early Development and Learning: Toward Common Views and Vocabulary* (Kagan, Moore, & Bredekamp 1995). In this elaborated definition (and in other work that is being done at the state level to define Goal 1) is a clear statement of high expectations for all children across the curriculum, addressing the child's total development and what he or she should learn, as well as supporting positive approaches toward learning.

Goal 3 (quoted on p. 6) is clearly content driven, dictating competence in five areas: English, mathematics, science, history, and geography. Goal 3 does, however, acknowledge that there are *people* in the learning process, referring to the need for children to "use their minds well" (think, reason, and problem-solve, we assume) in preparation for exercising worthy citizenship and for lifelong learning; herein lies the potential connection to Goal 1. It is appropriate for the curriculum to become more content centered as children make the cognitive shift, roughly between ages 5 and 7, from dependence on socially meaningful context for understanding to being more capable of abstract learning (Sameroff & McDonough 1994). At the same time, producing lifelong learners and productive citizens requires that attention be paid to the other dimensions—specifically, the social and emotional realms and approaches toward learning.

Just as conversations are needed across disciplines similar to those that have occurred within disciplines, so, too, are conversations needed between those who seek to achieve progress toward Goal 1 and those seeking progress toward Goal 3. The connection between the two goals should not be to push down to preschool the way in which subject matter is taught at higher levels but rather to think deeply about the earlier understandings and positive dispositions toward learning that underlie later, more abstract learning in each area. Progress made toward improving the early life experiences of very young children, supporting their early learning and development (NAEYC 1990), will directly affect how well these children are able to perform on learning goals at fourth grade and will have long-term implications for their ability to contribute as citizens of our democratic society.

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# 3

# Reaching Potentials through Transforming Curriculum, Assessment, and Teaching

*Sue Bredekamp and Teresa Rosegrant*

The primary purpose of this book is to address some of the most important and enduring questions about the content of the curriculum in programs for young children. Among the essential questions that teachers should ask when developing or evaluating curriculum are, Is this content worth knowing? Is it meaningful and relevant for these children's lives? Can it be made more relevant by relating it to experiences that children have had, or can they easily gain direct experience with it? Is the content accurate and credible according to the recognized standards of the relevant disciplines? Are the expectations realistic and attainable at this time, or could the children more easily and efficiently acquire the knowledge or skills later on? These questions are among those raised by NAEYC and NAECS/SDE (1992) in the guidelines for evaluating early childhood curriculum and assessment.

In this chapter we revisit some of the key concepts presented in Volume 1 of *Reaching Potentials* (see Bredekamp & Rosegrant 1992, Chapters 2, 3, & 5) that we believe represent fundamental tools for teachers of young children as they develop, plan, and implement curriculum. The purpose of this chapter is to discuss four important frameworks for planning, implementing, and evaluating curriculum in the various subject-matter disciplines; these ideas are applied in Chapters 4 through 11 in each of the specific content areas. The topics are

1. the curriculum and assessment guidelines;
2. perspectives that inform transformational curriculum planning: the knowledge base of the disciplines and ways of organizing curriculum goals to make them meaningful for young children, and knowledge of child development and learning—both predicted and actual—for a group of children;
3. the learning cycle as a strategy for making decisions about when curriculum expectations are appropriate; and
4. the roles of the teacher.

We begin with a summary of the curriculum and assessment guidelines (see Volume 1, pp. 9–27, for the complete position statement on curriculum and assessment).

## Curriculum and assessment guidelines

NAEYC and NAECS/SDE developed guidelines for appropriate curriculum content and assessment for young children; these guidelines reflect key points to keep in mind when making decisions about what children need to know and be able to do and how teachers

assess what children have learned. *Curriculum* is an organized framework that delineates the content that children are to learn, the processes through which children achieve the identified curricular goals, what teachers do to help children achieve these goals, and the context in which teaching and learning occur. *Assessment* is the process of observing, recording, and otherwise documenting the work children do and how they do it, as a basis for a variety of educational decisions that affect the child, including planning for groups and individual children and communicating with parents.

Guidelines are standards or principles by which to make a judgment or determine a course of action. The following statements are guidelines to use in making decisions about developing and/or selecting curriculum content for young children (what children are expected to know and be able to do).

## Guidelines for curriculum content

**1.** The curriculum has an articulated description of its theoretical base that is consistent with prevailing professional opinion and research on how children learn.

**2.** Curriculum content is designed to achieve long-range goals for children in all domains—social, emotional, cognitive, and physical—and to prepare children to function as fully contributing members of a democratic society.

**3.** Curriculum addresses the development of knowledge and understanding, processes and skills, dispositions and attitudes.

**4.** Curriculum addresses a broad range of content that is relevant, engaging, and meaningful to children.

**5.** Curriculum goals are realistic and attainable for most children in the designated age range for which they were designed.

**6.** Curriculum content reflects and is generated by the needs and interests of individual children within the group. Curriculum incorporates a wide variety of learning experiences, materials and equipment, and instructional strategies to accommodate a broad range of children's individual differences in prior experience, maturation rates, styles of learning, needs, and interests.

**7.** Curriculum respects and supports individual, cultural, and linguistic diversity. Curriculum supports and encourages positive relationships with children's families.

**8.** Curriculum builds upon what children already know and are able to do (activating prior knowledge) to consolidate their learning and to foster their acquisition of new concepts and skills.

**9.** Curriculum provides conceptual frameworks for children so that their mental constructions based on prior knowledge and experience become more complex over time.

**10.** Curriculum allows for focus on a particular topic or content while allowing for integration across traditional subject-matter divisions by planning around themes and/or learning experiences that provide opportunities for rich conceptual development.

**11.** Curriculum content has intellectual integrity; content meets the recognized standards of the relevant subject-matter disciplines.

**12.** Curriculum content is worth knowing; curriculum respects children's intelligence and does not waste their time.

**13.** Curriculum engages children actively, not passively, in the learning process. Children have opportunities to make meaningful choices.

**14.** Curriculum values children's constructive errors and does not prematurely limit exploration and experimentation for the sake of ensuring "right" answers.

**15.** Curriculum emphasizes the development of children's thinking, reasoning, decision making, and problem-solving abilities.

**16.** Curriculum emphasizes the value of social interaction to learning in all domains and provides opportunities to learn from peers.

**17.** Curriculum is supportive of children's physiological needs for activity, sensory stimulation, fresh air, rest, hygiene, and nourishment/elimination.

**18.** Curriculum protects children's psychological safety, that is, children feel happy, relaxed, and comfortable rather than disengaged, frightened, worried, or stressed.

**19.** Curriculum strengthens children's sense of competence and enjoyment of learning by providing experiences for children to succeed from their point of view.

**20.** Curriculum is flexible so that teachers can adapt to individual children or groups.

## GUIDELINES FOR APPROPRIATE ASSESSMENT FOR PLANNING INSTRUCTION AND COMMUNICATING WITH PARENTS

**1.** Curriculum and assessment are integrated throughout the program; assessment is congruent with and relevant to the goals, objectives, and content of the program.

**2.** Assessment results in benefits to the child, such as needed adjustments in the curriculum or more individualized instruction and improvements in the program.

**3.** Children's development and learning in all domains—physical, social, emotional, and cognitive—and their dispositions and feelings are informally and routinely assessed by teachers' observing children's activities and interactions, listening to them as they talk, and using their constructive errors to understand their learning.

**4.** Assessment provides teachers with useful information to successfully fulfill their responsibilities: to support children's learning and development, to plan for individuals and groups, and to communicate with parents.

**5.** Assessment involves regular and periodic observation of the child in a wide variety of circumstances that are representative of the child's behavior in the program over time.

**6.** Assessment relies primarily on procedures that reflect the ongoing life of the classroom and typical activities of the children. Assessment avoids approaches that place children in artificial situations, impede the usual learning and developmental experiences in the classroom, or divert children from their natural learning processes.

**7.** Assessment relies on demonstrated performance during real, not contrived, activities, for example, real reading and writing activities rather than only skills testing (Teale 1988; Engel 1990).

**8.** Assessment utilizes an array of tools and a variety of processes, including, but not limited to, collections of representative work by children (artwork, stories they write, recordings of their reading), records of systematic observation by teachers, records of conversations and interviews with children, and teachers' summaries of children's progress as individuals and as groups (Chittenden & Courtney 1989; Goodman, Goodman, & Hood 1989).

**9.** Assessment recognizes individual diversity of learning and allows for differences in styles and rates of learning. Assessment takes into consideration children's ability in English, their stage of language acquisition, and whether they have been given the time and opportunity to develop proficiency in their native language as well as in English.

**10.** Assessment supports children's development and learning; it does *not* threaten children's psychological safety or feelings of self-esteem.

**11.** Assessment supports parents' relationships with their children and does not undermine parents' confidence in their children's or their own ability, nor does it devalue the language and culture of the family.

**12.** Assessment demonstrates children's overall strengths and progress, what children *can* do, not just their wrong answers and what they cannot do or do not know.

**13.** Assessment is an essential component of the teacher's role. Since teachers can make maximal use of assessment results, the teacher is the *primary* assessor.

**14.** Assessment is a collaborative process involving children and teachers, teachers and parents, school and community. Information from parents about each child's experiences at home is used in planning instruction and evaluating children's learning. Information obtained from assessment is shared with parents in language they can understand.

**15.** Assessment encourages children to participate in self-evaluation.

**16.** Assessment addresses what children can do independently and what they can demonstrate with assistance, because the latter shows the direction of their growth.

**17.** Information about each child's growth, development, and learning is systematically collected and recorded at regular intervals. Information such as samples of children's work, descriptions of their performance, and anecdotal records is used for planning instruction and communicating with parents.

**18.** A regular process exists for periodic information sharing between teachers and parents about children's growth and development and performance. The method of reporting to parents does not rely on letter or numerical grades but rather provides more meaningful, descriptive information in narrative form.

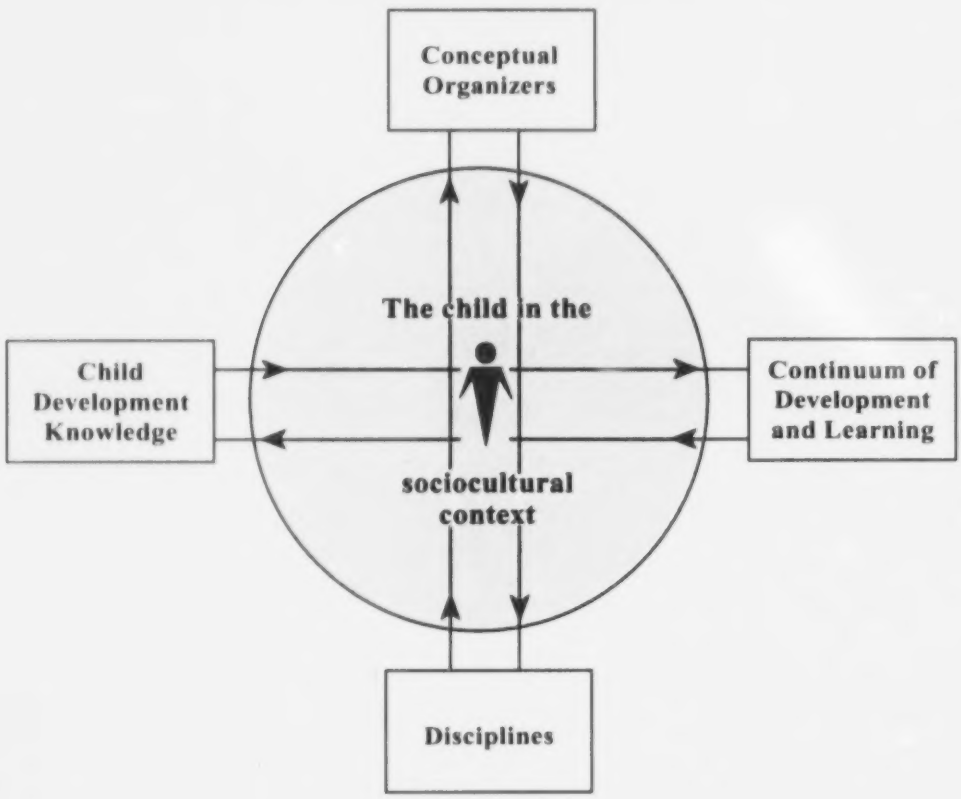
## A model of transformational curriculum: Perspectives that inform curriculum planning

Implicit in the curriculum and assessment guidelines are references to important perspectives on planning curriculum that help make learning meaningful for young children: integrated curriculum; whole child philosophy; intellectual integrity; and attention to individual children's needs and interests. We think of these perspectives as interrelated parts of a model of transformational curriculum (see Figure 1).

The vertical axis of the model represents knowledge that is meaningful to children. At the base of the model of transformational curriculum are the subject-matter *disciplines*. The knowledge base of the disciplines (science, mathematics, social studies, language arts, music, visual arts, health, and physical education) provide the key concepts that are a major source of curriculum content. Directly above the disciplines and standing atop the model of curriculum development are *conceptual organizers*, a term we use to stand for the various ways that discipline-based knowledge is made meaningful, relevant, and accessible for young children, such as integrated approaches, themes, units, or projects. To be meaningful to children, themes, projects, and the like must be grounded in children's experiences, both their experiences at home and in the community and the shared experiences of the group in school. For example, health studies of family life in preschool classrooms begin with children's sharing information about their own families and may extend to studies of animal families through observing classroom pets.

The horizontal axis of the model represents *knowledge of child development and learning*, both the normative and dynamic dimensions. The left end of the axis represents the need to draw on *child development knowledge*, what is known about how children typically learn and develop in all domains (cognitive, socioemotional, and physical), to use normative information to predict what discipline knowledge and conceptual organizers will be age appropriate. The other end of that axis represents the dynamic nature of child development and learning—*the continuum of development and learning* common to children—and also

*Figure 1.* TRANSFORMATIONAL CURRICULUM



***FOR CURRICULUM TO BE TRULY MEANINGFUL FOR YOUNG CHILDREN, EDUCATORS MUST PAY ATTENTION TO THE DISCIPLINES, MEANINGFUL CONCEPTUAL ORGANIZERS, AGE-APPROPRIATE EXPECTATIONS, AND INDIVIDUALLY APPROPRIATE EXPERIENCES.***

how the children in a specific group fit in relation to these generalizations about development and learning. To plan curriculum and provide a sequence for organizing curriculum goals, teachers draw on a predicted continuum of development and learning. But children vary in their rate and sequence of development and learning as a result of differences in their rates of growth and also as a result of their diverse backgrounds of social and physical experience. For example, children must first understand one-to-one correspondence before they can understand numerical operations such as addition and subtraction. While most children in kindergarten might be expected to have already acquired one-to-one correspondence, some will need intense support to develop this important mathematical concept before they can go on to other mathematical operations. Therefore, curriculum and teaching must be individually appropriate, that is, building on and adapting to the individual needs and interests of children. For curriculum to be truly meaningful for young children, educators must pay attention to at least these sources of information: the disciplines, meaningful conceptual organizers, age-appropriate expectations, and individually appropriate experiences, as the following example illustrates.

In the discipline of biological science, a fundamental concept is that living things have features that help them exist in different environments (AAAS 1993, 102). To introduce this concept to kindergartners, a teacher may choose to focus on a meaningful theme of study, such as farm animals. In establishing goals and expectations about animals, however, the teacher draws on knowledge of how children develop and learn, choosing to include some content and exclude other content. Five-year-olds can be expected to understand that various animals have characteristics that help them live in different climates or terrains, but children at this age would not be able to understand the complex process of evolution that led to these differences. Similarly, the teacher must attend to what she knows about the prior learning of the children in the group so that she can teach in their *zone of proximal development* (Vygotsky 1978), that is, the range of tasks that the child cannot yet handle alone but can accomplish with the help of adults or more skilled peers (Berk 1994). For instance, if the school is in rural Iowa, the teacher may find that she can delve more deeply into the study because the children all know the basic characteristics of farm animals; a kindergarten teacher in an urban school district would more likely need to provide children with firsthand experiences with farm animals, from which they could begin to observe similarities and differences, or she may broaden the topic to include zoo animals or domestic pets with which the children have had experience. To scaffold children's learning (Berk & Winsler 1995) teachers must consider the continuum of development and learning for individuals and groups. In fact, a kindergarten teacher in an urban setting may teach the same science concept discussed at the beginning of this paragraph by using plants and engaging children in a study of which plants survive indoors and outdoors in various urban environments. In other words, children can gain understanding of scientific constructs through various kinds of meaning-centered approaches when teachers pay attention to what is experientially meaningful, choose activities that are age- and individually appropriate, and support and challenge children's learning.

## The cycle of learning: A description of how people learn

The process of learning is complex and has been described in many ways. One helpful way of thinking about learning is to visualize the process as "a recurring cycle that begins in awareness and moves to exploration, to inquiry, and finally, to utilization" (NAEYC & NAECS/SDE 1992, 16; see also Bredekamp & Rosegrant 1992, 32–36). This cycle is not developmental in the pure sense of the word because it is similar for children and adults when they acquire new knowledge or skill. For example, when an adult confronts a new computer software package, immediate utilization is difficult. More often, the adult first must become aware of and explore the features of the new package, and then he or she can easily adapt this trial-and-error learning to make sense of the directions in the user manual.

To learn something new, children must become aware, be able to explore and inquire, and then use and apply what they have learned. This process occurs over time and reflects movement from learning that is informal, concrete referenced, and governed by the child's own rules, to learning that is more formal,

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refined, more removed in time and space from concrete referents, and more reflective of conventional rule systems. The time in which a learning cycle takes place may be days or years. The learning cycle is recurring because when the learner uses knowledge or skills, new awareness is created about what is not known or understood.

To illustrate the learning cycle using the science example described earlier, most preschool children are aware of and have some opportunity to explore knowledge about farm animals either directly or through television and picture books. Many children of preschool age may still be inventing their own categories of animals and may not distinguish real ones from fantasy creatures, such as those in Dr. Seuss stories. Teachers and parents support children's inquiry into the study of animals by giving them experience and instruction that requires adapting their own concepts to the more conventional views of animals. Later in school, children use this more conventional understanding to form well-established concepts about animals, such as the scientific understanding that animals have different characteristics related to the environments in which they live. In this case, the time needed to experience the entire learning cycle varies depending on children's experiences but is probably a matter of months.

Research demonstrates that children's ability to form hypotheses and move toward more abstract or conventional understandings of scientific concepts is influenced by several things, including how the question is posed, the experiences children have had, and the content-specific knowledge that they have acquired (Metz 1995). The learning cycle is one way of depicting this process of acquiring knowledge. Children who grow up on farms become aware of animals and have many opportunities for exploration at very early ages; most likely their ability to use such knowledge would come earlier than would this same ability in urban children. At the other extreme, adults who have little experience with animals and minimal content-specific knowledge in zoological science may think more like preschoolers with regard to a scientific concept such as the one discussed above (Gardner 1991); they might assume, perhaps, that placing a shorthaired animal in a cold climate would lead automatically to their growing longer hair.

The learning cycle is a useful tool for curriculum planning for several reasons. The same discipline content can be made more meaningful, more culturally appropriate, more age appropriate, or even more individually appropriate, depending on whether the goal is awareness, exploration, inquiry, or utilization. As we will see in many of the chapters on the disciplines that follow, national standards (especially performance standards) are very different, depending on whether the expectation is awareness or utilization. For standards such as mathematics that apply across an age span such as K–4, most often the expectation for the earlier grades is awareness and exploration, while the expected outcome at Grade 4 is utilization. In the understanding of a highly complex mathematical concept such as fractions, for example, the learning cycle occurs over an extended period of time. In the early grades children become aware of and explore the concept of fractions by solving real problems, such

as dividing pies in halves or quarters or building with unit blocks. Using symbols for fractions is not expected until later in the primary grades, after children have had many experiences exploring the meaning of fractions.

Within a group, a teacher who attends to children's individual development will vary her expectation, depending on where she perceives a child to be in the learning cycle. For example, after a child has had many opportunities to explore and use fractions to solve real-life problems throughout early childhood, the teacher demonstrates and explains the conventional ways of writing fractions toward the end of the primary grades. This example illustrates the fundamental role of the teacher, to which we now turn.

## The roles of the teacher

A recurring theme across the discussion that follows in the various disciplines is the critical role of adults in supporting children's learning. Such a statement seems so obvious as to go without saying. Unfortunately, one of the common misperceptions about Piaget's theory, with its emphasis on the child's construction of knowledge, is that somehow children construct understanding in isolation and that adult intervention in children's learning and development is not necessary or valuable. Nothing could be more untrue, as Piaget himself would undoubtedly have agreed (Metz 1995). For too long, early childhood practice has been simplistically characterized as a dichotomous choice between child-centered and teacher-directed learning. To illustrate the greater complexity of early childhood teaching, we suggested a continuum of teaching behaviors in Volume 1 (Bredekamp & Rosegrant 1992, 39–42). This continuum (see Figure 2) moves from nondirective to directive on the part of the teacher, emphasizing that any one of these teacher behaviors is appropriate at some time, while sole reliance on any one strategy would prove ineffective. We, as well as the various authors in this book, find Vygotsky's theory of learning a useful tool for conceptualizing the role of the early childhood teacher (Edwards 1993; Berk & Winsler 1995, 149–53). A recurring theme through the subject-matter chapters is that although children do need opportunities to become aware and explore, especially through play, they also need adult support to reach "new levels of competence. [When teaching in the zone of proximal development, teachers] help children select developmentally appropriate joint and individual activities; modify difficult tasks to an appropriate level of challenge by adjusting the activity, the degree of adult assistance, or both; and set expectations for classroom behavior that are consistent with children's emerging cognitive and social capacities" (Berk & Winsler 1995, 151).

Such teaching is possible only when teachers understand the many ways in which children develop and learn and the variety of activities that are required to promote the development and learning of every child. In addition, teachers must have a sense of the developmental continuum of learning in the disciplines, as well as the ability to engage in systematic and ongoing assessment of children's learning and development

*Figure 2.* CONTINUUM OF TEACHING BEHAVIORS

| NONDIRECTIVE | | MEDIATING | | | | | DIRECTIVE |
|---|---|---|---|---|---|---|---|
| Acknowledge | Model | Facilitate | Support | Scaffold | Co-construct | Demonstrate | Direct |
| *give attention and positive encouragement to keep a child engaged in an activity* | *display for children a skill or desirable way of behaving in the classroom, through actions only or with cues, prompts, or other forms of coaching* | *offer short-term assistance to help a child achieve the next level of functioning (as an adult does in holding the back of a bicycle while a child pedals)* | *provide a fixed form of assistance, such as a bicycle's training wheels, to help a child achieve the next level of functioning* | *set up challenges or assist children to work "on the edge" of their current competence* | *learn or work collaboratively with children on a problem or task, such as building a model or block structure* | *actively display a behavior or engage in an activity while children observe the outcome* | *provide specific directions for children's behavior within narrowly defined dimensions of error* |

in relation to the various continua. Finally, teachers must understand the important role of sociocultural context and its influence on development and learning. Recognizing the critical role of language and social interaction to development and learning, teachers construct classrooms as communities of learners (Berk & Winsler 1995, 153).

In Chapters 4 through 11, each of the subject-matter disciplines is visited to address these issues in greater detail from different perspectives. We will see that from diverse disciplinary perspectives, authors share similar concerns about the early childhood curriculum. They call for early childhood educators to respect the intellectual integrity of discipline-based knowledge and to not water down the learning experience, even for the youngest child. They emphasize that in so doing, we must respect what we know about children's learning capabilities in general yet also recognize the need to build on individual children's prior knowledge and experience. In every discipline area we see emphasis on the role of the teacher as assessor and supporter of learning. As we will see from very diverse disciplinary perspectives, the early childhood teacher is key to young children's reaching their potentials.

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# 4 Transforming Mathematics Curriculum

*Kathy Richardson and Leslie Salkeld*

Before we can look at what it means to teach mathematics to young children in developmentally appropriate ways, we must first answer the question, What mathematics do we want children to learn? The National Council of Teachers of Mathematics (NCTM) responded to the call for reform in the teaching and learning of mathematics by publishing *Curriculum and Evaluation Standards for School Mathematics*. "Inherent in this document is a consensus that all students need to learn *more*, and often *different*, mathematics and that instruction in mathematics must be significantly revised" (1989, 1, emphasis added).

Mathematics is not the subject that most adults experienced in school. Mathematics is not the learning of rote procedures for getting right answers, nor is it memorizing basic facts and multiplication tables or doing well with flashcards and timed tests. At the heart of mathematics is the search for sense and meaning, patterns and relationships, order and predictability. Success in mathematics is the development of mathematical power:

> Mathematical power includes the ability to explore, conjecture, and reason logically; to solve nonroutine problems; to communicate about and through mathematics; and to connect ideas within mathematics and between mathematics and other intellectual activity. Mathematical power also involves the development of personal self-confidence and a disposition to seek, evaluate, and use quantitative and spatial information in solving problems and in making decisions. Students' flexibility, perseverance, interest, curiosity, and inventiveness also affect the realization of mathematical power. (NCTM 1990, 1).

Mathematical power develops in children who learn that mathematics makes sense and who learn to trust their own abilities to make sense of mathematics. The challenge for those of us interested in the education of young children is to help ensure that the movement to bring more and different mathematics to children results in curriculum and assessment practices that are consistent with what we know about how young children learn and the way their development affects their learning. In the past, *more* and *different* often meant adding pressure to the lives of children and assuming that more can be accomplished if we just start younger and expect more. The opportunity is here to develop mathematics programs that maximize children's learning rather than giving the appearance of high expectations while in reality engaging in inappropriate practices that interfere with children's developing understanding.

In this chapter we identify important ideas in mathematics, as presented in the National Council of Teachers of Mathematics' *Curriculum and Evaluation Standards for School Mathematics* (NCTM 1989). We examine what it means to teach in developmentally appropriate ways by applying the NAEYC framework to the NCTM standards. We explore the teacher's role in providing mathematical experiences to children and

assessing their growth in mathematical understanding. Much of the chapter is devoted to looking at the major content areas identified in the *Curriculum and Evaluation Standards* (NCTM 1989) and, through classroom examples, showing how they can be presented in developmentally appropriate ways. We use one of the content areas (in this case, geometry) to more fully describe how such lessons might unfold in a classroom setting. We look at three classrooms to show how children of different ages can have developmentally appropriate learning experiences that help them move toward a deeper understanding of important mathematical ideas.

## Important ideas in mathematics: The NCTM standards

In the document *Curriculum and Evaluation Standards for School Mathematics*, the National Council for Teachers of Mathematics (1989) identifies 13 curriculum standards for kindergarten through fourth grade (see adjacent box). Four of the curriculum standards look at the nature of mathematical thinking and focus on

mathematics as problem solving;

mathematics as reasoning;

mathematics as communication; and

mathematical connections.

Far from being a subject in which students passively fill in pages in a workbook, learning mathematics is an active endeavor. Children need to experience mathematics as *problem solving:* investigating, seeing what happens if . . . , and using mathematics to find out things for themselves that they do not already know. Rather than trying to figure out what the teacher wants them to do, children need to understand that mathematics is about *reasoning:* making conjectures about why something is the way it is and then checking out those conjectures; thinking for oneself rather than trying to figure out what the teacher wants. Rather than being a task done quietly by a child at her desk, mathematics is about *communication:* clarifying her thinking by talking to her friends, by listening to what they have to say, by finding ways to write down her experiences and her thinking with words, with diagrams and pictures, and with mathematical symbols. Rather than being a set of isolated skills and procedures to be practiced and drilled until they are mastered, mathematics is about *connections:* seeing the relationships between mathematical ideas, seeing mathematics everywhere one looks.

**Curriculum and Evaluation**

**1. Mathematics as problem solving**

The study of mathematics should emphasize problem solving so that children can

- use problem-solving approaches to investigate and understand mathematical content;
- formulate problems from everyday and mathematical situations;
- develop and apply strategies to solve a wide variety of problems;
- verify and interpret results with respect to the original problem; and
- acquire confidence in using mathematics meaningfully.

**2. Mathematics as communication**

The study of mathematics should include numerous opportunities for communication so that children can

- relate physical materials, pictures, and diagrams to mathematical ideas;
- reflect on and clarify their thinking about mathematical ideas and situations;
- relate their everyday language to mathematical language and symbols; and
- realize that presenting, discussing, reading, writing, and listening to mathematics are a vital part of learning and using mathematics.

**3. Mathematics as reasoning**

The study of mathematics should emphasize reasoning so that children can

- draw logical conclusions about mathematics;
- use models, known facts, properties, and relationships to explain their thinking;
- justify their answers and solution processes;
- use patterns and relationships to analyze mathematical situations; and
- believe that mathematics makes sense.

**4. Mathematical connections**

The study of mathematics should include opportunities to make connections so that children can

- link conceptual and procedural knowledge;
- relate various representations of concepts or procedures to one another;
- recognize relationships among different topics in mathematics;
- use mathematics in other curriculum areas; and
- use mathematics in their daily lives.

**5. Estimation**

The curriculum should include estimation so that children can

- explore estimation strategies;
- recognize when an estimate is appropriate;
- determine the reasonableness of results; and
- apply estimation in working with quantities, measurement, computation, and problem solving.

**6. Number sense and numeration**

The curriculum should include whole number concepts and skills so that children can

- construct number meanings through real-world experiences and use of physical materials;
- understand our numeration system by relating counting, grouping, and place-value concepts;
- develop number sense; and
- interpret the multiple uses of numbers encountered in the real world.

**7. Concepts of whole number operations**

The curriculum should include concepts of addition, subtraction, multiplication, and division of whole numbers so that children can

- develop meaning for the operations by modeling and discussing a rich variety of problem situations;
- relate the mathematical language and symbolism of operations to problem situations and informal language;
- recognize that a wide variety of problem structures can be represented by a single operation; and
- develop operation sense.

**8. Whole number computation**

The curriculum should develop whole number computation so that children can

- model, explain, and develop reasonable proficiency with basic facts and algorithms;
- use a variety of mental computation and estimation techniques;
- use calculators in appropriate computational situations; and
- select and use computation techniques appropriate to specific problems and determine whether results are reasonable.

**9. Geometry and spatial sense**

The curriculum should include two- and three-dimensional geometry so that children can

- describe, model, draw, and classify shapes;
- investigate and predict the results of combining, subdividing, and changing shapes;
- develop spatial sense;
- relate geometric ideas to number and measurement ideas; and
- recognize and appreciate geometry in their world.

**10. Measurement**

The curriculum should include measurement so that children can

- understand the attributes of length, capacity, weight, area, volume, time, temperature, and angle;
- develop the process of measuring and concepts related to units of measurement;
- make and use estimates of measurement; and
- make and use measurement in problem and everyday situations.

**11. Statistics and probability**

The curriculum should include experiences with data analysis and probability so that children can

- collect, organize, and describe data;
- construct, read, and interpret displays of data;
- formulate and solve problems that involve collecting and analyzing data; and
- explore concepts of chance.

**12. Fractions and decimals**

The curriculum should include fractions and decimals so that children can

- develop concepts of fractions, mixed numbers, and decimals;
- develop number sense for fractions and decimals;
- use models to relate fractions to decimals and to find equivalent fractions;
- use models to explore operations on fractions and decimals; and
- apply fractions and decimals to problem situations.

**13. Patterns and relationships**

The curriculum should include the study of patterns and relationships so that children can

- recognize, describe, extend, and create a wide variety of patterns;
- represent and describe mathematical relationships; and
- explore the use of variables and open sentences to express relationships.

* *Excerpted with permission. The full standards provide additional detail.*

Nine of the curriculum standards deal with the content of mathematics:

- number sense and numeration
- estimation
- concepts of whole number operations
- whole number computation
- fractions and decimals
- geometry and spatial sense
- measurement
- statistics and probability
- patterns and relationships

In the past, one view of mathematics was limited to the study of arithmetic, which was often presented to children in ways that interfered with rather than enhanced their ability to know and understand important mathematical ideas. The NCTM standards broaden our view of what mathematics can be and how it should be presented to children. We can no longer think about the subject as a list of skills to be mastered but rather as important big ideas that we want children to understand. The *Mathematics Model Curriculum Guide, Kindergarten through Grade Eight*, published by the California State Department of Education, refers to these basic mathematical ideas as the Essential Understandings.

> These understandings . . . are developed, elaborated, deepened, and made more complete over time. (1987, 13)

> An important characteristic of the essential understandings is that they can be encountered at many different levels of complexity and abstraction. Therefore, they can be experienced in some way at all grade levels. They are those worthy mathematical ideas that can be explored in some way by the five year old as well as by the thirteen year old. (p. 15)

These understandings become part of the way children look at the world and help them to make sense of the world around them.

## Applying the NAEYC framework to the NCTM standards

The NCTM standards answer the question, What mathematics do we want children to learn? The NAEYC guidelines point out that learning any concept or discipline happens in stages (NAEYC & NAECS/SDE 1992; this volume, pp. 16–17). The guidelines identify the stages of concept development as awareness, exploration, inquiry, and utilization. This cycle of learning (Bredekamp & Rosegrant 1992; this volume, pp. 19–21) can guide teachers' observations of children and provide a way of looking at their learning. Children's thinking and understanding evolve. As children create meaning, their view of the world moves from being governed by their own rules toward understanding the conventional rule systems of society. Curriculum that is developmentally appropriate reflects the fact that children learn from their own experiences and allows children to make sense of those experiences in their own way. Accepting children's ways of thinking allows teachers to present ideas in all their complexity rather than oversimplifying them in order to ensure "success." Recognizing that children can grapple with an idea before they can be expected to fully understand it allows us to challenge them in a way that we could not if we expected them to always be right, from the adult point of view. Many times children will surprise us with their ability to figure things out if we allow them to do so. Developmentally appropriate curriculum does not put unreasonable demands on children, nor does it put limits on children's learning.

Much has been written describing the development of number concepts in young children that cannot be adequately summarized here (see the bibliography at the end of this chapter for additional information). However, two points are particularly important to consider as we move from teaching mathematics through drill and practice of rote procedures to teaching mathematics in ways that consider how children develop an understanding of concepts. First, what is obvious to adults is not obvious to children and cannot be easily explained to them (Labinowicz 1980); and second, the link between symbols and the concepts they represent is not always clear to children (Hughes 1986). A more detailed discussion of each of these points follows.

### *What is obvious to adults is not obvious to children and cannot be easily explained to them*

In fact, inappropriate instruction or attempts to make a child understand something that seems obvious to an adult can interfere with the child's confidence in his ability to make sense of things. Two math-related concepts for which children's own thinking is particularly evident are conservation and place value. In both of these concepts, children move from their own rules and views of the world to the conventional rule systems of our society.

*Conservation* is a basic concept that affects the way children come to understand math concepts. At the risk of oversimplifying, let us say that conservation

refers to the ability to know that a particular amount is not changed even though it is rearranged or seems different in some way (Labinowicz 1985). Consider the following examples of children who have not yet developed conservation.

Jill's kindergarten teacher considers her to be one of the most advanced students. In March of her kindergarten year, Jill's teacher decides to challenge her thinking by asking her to make as many groups of ten as she could with a pile of 25 wooden cubes. Jill begins the task by lining up 10 blocks and then proceeds to make another row of blocks underneath the first row. Because she leaves spaces between each block, however, she ends up making a row that seems to be the same length but uses only eight blocks. When the teacher asks how many blocks are in the second row, Jill replies, "Ten." When she counts them to check, Jill is surprised to discover there are only eight.

Tad, a second-grader, arranges 36 buttons into three groups of ten, with six left over. He can tell without counting that there are 36 buttons. His teacher asks, "How many would there be if we counted them by fives?" Tad thinks for a moment and says, "Fifty-five." He then counts them by fives and reports that there are 36. The teacher then asks, "How many would there be if we counted them by twos?" Tad thinks again and then replies, "Forty-two" (Richardson 1990b).

Mrs. Lee shows her first-grade students two jars of different shapes, one much taller than the other. She asks the children to decide if the tall, narrow jar would hold more, the same, or less rice than the shorter, wider jar. After the children make their predictions, she fills the tall jar with rice and then pours it into the shorter jar. When the rice from the tall jar exactly fills the short jar, Jack exclaims, "Well, I see it. But I don't believe it!"

The term *place value* is used to mean many different and complex ideas (Labinowicz 1985). Some people believe that children understand place value when they can write numbers above 10 and label the ones, tens, and hundreds places. Other people believe that children understand place value when they can look at drawings of bundles of tens and leftovers and write the correct numerals. Others say that children understand place value if they can add and subtract two- or three-digit numbers with regrouping or, conversely, that they do not understand place value if they cannot add and subtract two-digit numbers. Because what is commonly referred to as place value involves many complex ideas, we must ask questions and look for clues to children's thinking in many situations to determine what they do and do not understand. Following are examples of misconceptions that children may have as they grapple with understanding place-value concepts.

***AS CHILDREN CREATE MEANING, THEIR VIEW OF THE WORLD MOVES FROM BEING GOVERNED BY THEIR OWN RULES TOWARD UNDERSTANDING THE CONVENTIONAL RULE SYSTEMS OF SOCIETY.***

Each morning since school began, Mrs. Cesena's class of 5- and 6-year-olds has recorded the number of days they have attended school. As of yesterday they had been in school 56 days. Mrs. Cesena today asks the class, "How many days have we been in school?"

The class responds, "Fifty-seven!" "How do we write fifty-seven?" she asks. "Five tens and seven ones," the children direct, as Mrs. Cesena writes 57.

Later that day, Connie's mother brings in 34 cupcakes to celebrate Connie's birthday. Mrs. Cesena tells the class there are 34 cupcakes and wonders out loud, "How many groups of ten do you think we could make with these 34 cupcakes?"

The children raise their hands to share their various ideas. "I think six tens." "Eight tens." "I think four tens."

Mrs. Cesena decides to remind them of what they already know about tens and ones. "How would we write thirty-four?" she asks. Without hesitation, the class choruses, "Three tens and four ones." However, not one child wants to change his estimate. Being able to describe 34 in terms of tens and ones does not link in the children's minds to the 34 cupcakes. Mrs. Cesena remembers that children can often use words correctly without fully understanding the concepts.

Mr. Tinder writes a problem on the board and asks his second-grade class to solve it using the interlocking cubes:

$$\begin{array}{r} 34 \\ -19 \\ \hline \end{array}$$

Saul writes down the correct answer without using the manipulatives; but when trying to show what the numbers mean, he puts out three cubes and four cubes and then cannot find a way to take away nine. Saul has learned to write answers to problems without really understanding what those numbers represent.

LeeAnn snaps together three trains of 10 cubes and then puts out 9 extra cubes. She then breaks apart one of the trains and puts those 10 cubes with the 9 extras. Mr. Tinder asks LeeAnn, "How many loose cubes do you have now?" LeeAnn says without hesitation, "Nineteen, 'cause 10 and 9 is 19." Before she takes any cubes away, Mr. Tinder asks, "How many cubes do you have altogether on your board now?" LeeAnn

replies, "Forty-nine, because I just added ten more to the extras." LeeAnn cannot yet think simultaneously about adding 10 to the loose cubes while taking 10 away from the groups of ten; her focus is only on the 10 she had added (Richardson 1988).

### *The link between symbols and the concepts they represent is not always clear to children*

Children may understand concepts but may not relate what they know to the symbols representing those concepts (Hughes 1986). They also can learn to deal with symbols without understanding them, as illustrated by the following examples.

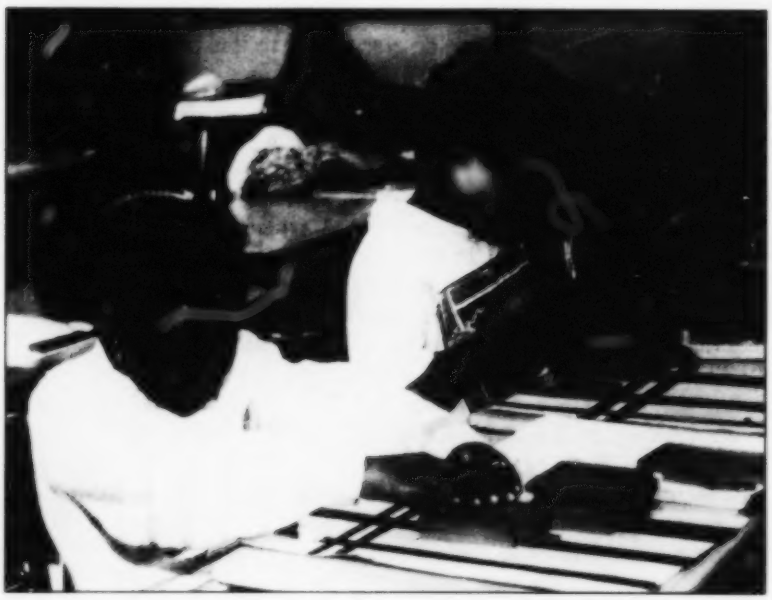
Nick is working to complete a page of addition problems assigned by his first-grade teacher. He goes through a routine of counting his fingers to determine the answer to each one. Mrs. Hinojos watches Nick for a time and then decides to see what he understands about addition. She asks Nick, "If you had five cookies and I gave you three more, how many would you have?"

Without hesitation, Nick responds, "Eight." "How come you counted on your fingers when you did that problem if you already knew the answer?" Mrs. Hinojos asks. Nick seems puzzled. "These are my math problems. You asked me about cookies."

Sara, Nick's classmate, has been practicing subtraction facts at home with her mother. Today, she wants to show her friend that she can subtract, so she writes on the chalkboard, "7 – 3 = 4." Her teacher walks by, notices what she is doing, and asks Sara to show her what the problem means with some counters. Sara puts out seven counters, then gets three more. She takes away the group of three and sees that she has seven left. When she looks at her answer and sees it is 4 and not 7, she looks puzzled. She decides to try something else. This time she puts out three counters first and then seven. She takes away the three and still has seven left. Now she knows what to do. She just takes the eraser and erases the "wrong" answer and replaces it with a 7.

Gina has been working with place value in her second-grade class. She has been working with manipulatives and can figure out problems such as 42 – 19. When she is asked to do a worksheet without the manipulatives, however, she writes 37 as her answer. When asked how she got her answer, she explains, "You can't take nine from two so you have to take two from nine." She does not seem to be thinking at all about the quantities represented by the numbers or whether or not her answer is reasonable. She simply deals with the symbols themselves.

Some of the above responses are the result of natural stages of thinking and understanding that children move through as they explore concepts and ideas. Other responses are the result of misunderstandings that occur when adults ask children to perform tasks and procedures that they do not understand. When teachers try to teach children the adult way of thinking or of getting answers, they can interfere with children's sense-making process. Children stop looking for their own meaning and, instead, look to the teacher to see if they are right or wrong.



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## The teacher's roles

Teachers who wish to support the development of understanding of mathematical ideas must create an environment in which children are actively engaged in thinking about mathematics. They must be interested in what the children are really thinking and understanding rather than in simply making sure that the child can complete assigned tasks.

### *Engaging children in mathematical tasks*

When teachers choose or create developmentally appropriate curriculum, they must recognize that no matter what the age of the children, teaching mathematics is about finding ways to engage chil-

dren in thinking about mathematical ideas. Allowing children to make sense of ideas in their own way, however, does not mean that the teacher stands passively by, waiting for children to learn. Teachers need to know what concepts they want children to become aware of, explore, interact with, and think about. The teacher's task is to provide opportunities for children to learn by purposefully setting up the environment so that children are supported in the development of particular ideas. Understanding is achieved through the direct personal experiences of the learner and his or her thinking about those experiences. However, thinking can often be stimulated by the teacher's questions or interactions with other children. When children hold misconceptions, the teacher can often help them come to new insights by providing additional experiences that allow children to look again from another point of view. The teacher provides opportunities for children to consider, notice, and draw conclusions. For example, when a child who has just witnessed a demonstration of conservation says, "I see it, but I don't believe it!" the teacher can respond by providing opportunities for the child to work with various jars and various materials and explore for himself what happens when he pours rice from one size of jar into another. When LeeAnn reveals that she thinks the number changes, the teacher can respond by asking LeeAnn to count and see for herself. One experience is not enough for any child as she develops concepts. Important mathematical ideas develop over time. Through encountering an idea in different settings and in many different ways over time, children begin to form generalizations.

### *Assessing growth in the learning of mathematics*

The National Council of Teachers of Mathematics (1995) also developed standards for the assessment of school mathematics. These standards acknowledge that the developing mind of a child is far too complex and changing to be analyzed in terms of a checklist. Adults could never keep track of all that a child is learning, even in one area of mathematics. Nevertheless, the complexity of the situation does not release teachers from the obligation of knowing as much about children as possible, because the perception of children's needs guides teachers to provide opportunities that enhance children's learning. Teachers need to look at assessing children, not to evaluate them, nor to determine mastery, nor to make judgments, but to gather information. If teachers engage children in mathematical tasks, the teachers will get the information they need by observing and interacting with them. Teaching and assessing become one and the same. Teachers get more and better information from children when children work with tasks that have meaning for them and are encouraged to make sense of their work for themselves. Children will share what they are really thinking instead of trying to read the teacher's face for a clue to the right answer. When teachers are clear about the mathematical concepts they want children to understand, and recognize the natural stages through which children move as they develop these concepts, teachers are able to assess and support this growth.

## The NCTM standards in the classroom: What do we teach, and when do we teach it?

As the previous section implies, the question, What do we teach, and when do we teach it? cannot be answered by a list of concepts and skills assigned to specific grade levels or ages of children. When mathematics is seen as big ideas that develop over time, it becomes apparent that these ideas cannot be chopped up into "grade-level pieces," parceling out some ideas to this grade and other ideas to that grade. Instead of determining *when* a specific concept is to be taught, the teacher must find ways for children of all ages to experience these important ideas in forms that are accessible to them. The question becomes, What are the important mathematical ideas, and *how* (rather than when) should they be presented to the children we work with?

A complete discussion of all the mathematical ideas for children from 3 to 8 years old to experience is not possible within the scope of one chapter. But we can describe some of the concepts we want children to grow to understand and give examples of ways in which they might reach understanding. The following examples illustrate the application of the NCTM standards for math content for young children:

- number sense and numeration;
- estimation;
- concepts of whole-number operations;
- whole-number computation;
- measurement;
- patterns and relationships;
- statistics and probability (working with data); and
- geometry and spatial sense.

These examples describe what teaching mathematics in developmentally appropriate ways is about.

## *Number*

The development of number concepts involves much more than the ability to count by rote or recognize numerals. Children need to understand that numbers are used to describe quantities and relationships and are useful tools for getting information about the world they live in. No matter what size numbers they are working with, children need to be able to count accurately and efficiently, to be able to count on from a specific number and count back, to see relationships between numbers, to be able to take a specific number apart and put it back together. Children develop counting strategies, including an understanding of counting by groups, e.g., by twos or by fives. They begin to develop an appreciation for the structure of the place-value system as a way of dealing with counting large numbers of objects. They understand that the operations of addition, subtraction, multiplication, and division are related to each other and are useful tools for getting information in specific situations. Once children understand the concepts, they are able to use symbols to represent these numerical ideas. Children develop number concepts by working with real things. They should have opportunities to explore number concepts in the context of other mathematical strands. Measurement activities often give children a reason to count. Data collection and the display of information on graphs give children content in which to compare numerical information. Buying and selling in a classroom store can help children see the practical value of numbers. As important as these mathematical experiences are to the development of number concepts, children also need opportunities to experience the world of number through games and other number explorations. Following are examples of how teachers support children's understanding of estimation, number combinations to ten, and place value.

***Counting/estimating.*** Mrs. Kitchens's preschool class loves to count the number of children at school each day, the number of leaves they find on their walk, the number of steps it takes to walk across the rug, and the number of children in the sandbox. When children play with various materials in the room, the teacher notices that they like to count on their own, too. When children count by themselves, some do not always count each object once and only once, but they seem to enjoy the rhythmic quality of the counting chant and do not always care what number they end up with. When Mrs. Kitchens asks Gennie to bring her six paintbrushes, she notices that Gennie gets so involved in counting that she does not stop when she gets to six. Mrs. Kitchens watches Paul as uses Unifix cubes to make a giraffe to match a picture on a card. He is concentrating so he can make it exactly like the picture, and he counts and recounts to make sure of the number of cubes in each leg. Mrs. Kitchens invites several children to play a game with her using the large, dotted dice. Randy has the first turn and rolls the dice. He looks up at Mrs. Kitchens and asks, "Which dot do I count first?" Tenisha responds before Mrs. Kitchens can, "You don't even have to count. You can just look and see there is five."

*Mrs. Kitchens wants to provide many opportunities for her children to count. She recognizes and accepts the many different counting skills her children have developed and tries to find opportunities to support and challenge each one.*

Mrs. Bylund shows her first-grade class an empty jar and asks the children to estimate the number of walnuts they think will fit in the jar. The estimates range from 5 to 40. The class counts with her as she begins to fill the jar. When the jar holds six walnuts and is about half full, she asks the children if they want to make a new estimate. The new estimates range from 9 to 25. Lynn is very eager to tell her estimate and to share her thinking. "I think it will be 11," she says confidently, "because it's half full, and 6 and 6 is 11."

*Mrs. Bylund gives her students lots of opportunities to estimate quantities. She wants the number words they use to begin to have some meaning for them. She notices a wide range of responses in her children but knows that the children's ability to make reasonable estimates will improve with experience. Steve guessed 40 because it was a number he could say, but it had no meaning for him yet. Gerry guessed 8 even after she could see 6 walnuts; she didn't seem to have an idea of the relationship between 6 and 8. Eight just seemed like a big number and was, therefore, an appropriate number to Gerry. Lynn understood that she could use relationships to figure out a reasonable estimate. She has developed an important estimating skill but is still learning specific relationships, such as 6 plus 6. The teacher does not need to correct Lynn at this point because the experience that the class will have when they check their estimates will show Lynn the actual result.*

***Number combinations to 10.*** Mr. Scott wants his 6- and 7-year-old children to know the number combinations for numbers through 10. He realizes that this means something much different from using flashcards to memorize the combinations. He wants the

children to know, through many experiences, the relationships between numbers and the parts that make up the numbers. One of the experiences he provides children is working with creating designs with toothpicks, tiles, and other math manipulative materials. The children then describe their designs using numbers. For example,

4 and 2 4 and 1 4 and 4 5 and 2

The children sometimes make recordings of their designs, which Mr. Scott keeps to use as flashcards. Sometimes he holds up several designs and asks the children to tell him quickly how many they see. The children are getting very good at calling out the total number of toothpicks and describing how they know. For example, when Mr. Scott holds up this design,

he hears things like, "I know there's seven because three and four make seven" or "I see two and three. That's five, and two more makes seven." One day he decides to call out some problems and dismiss the children to go to the library as they are able to answer. He calls out, "What's three and four?" Much to his surprise, every child in the room puts up three fingers and four fingers and starts counting. After talking to the children about what they are doing, he begins to realize that when he said "three and four" the children thought of a 3 and a 4 and did not know what numeral the total would be. However, when he says, "What's three toothpicks and four more toothpicks?" the children call out in chorus, "Seven."

Someone once said that for young children, numbers are adjectives, not nouns. They cannot think about quantities in the abstract; instead they need something to think about. When adults simply label the numerals with words, such as "toothpicks" or "cookies," children are able to think of quantities and not symbols (Hughes 1986).

***Place value: Working with large numbers.*** Ms. Laird brought in a bag of peanuts for her 6- and 7-year-old students to estimate and count. After the children had had an opportunity to estimate the number of peanuts they thought were in the bag, Ms. Laird had several children help in the task of counting by having them put 10 peanuts each in small margarine tubs. They ended up with eight tubs of ten with seven left over. "How many tens do we have?" Ms. Laird asked. "Eight!" chorused the children. "And how many leftovers?" she continued. "Seven!" was the reply. "How many is that altogether?"

Before she could direct the class to count by tens to determine the total, several little hands reached out and dumped the peanuts back into a pile so they could count them. As Peter watched the peanuts being counted, he smiled quietly to himself. "I don't have to count," he said. "I can see there are 87."

*Ms. Laird thought that by grouping the peanuts into tens and ones, her students would see the usefulness of counting by tens to see what they had. She was reminded that what is obvious to her is not necessarily obvious to them. They still need the reassurance of counting by ones to* know *how many.*

Mr. Thomas wants the children in second grade to begin adding large numbers, but he wants to build on the children's own sense-making abilities rather than presenting a formal method for getting answers. Mr. Thomas writes the number 36 on the board and asks the children to make that number with Unifix cubes. The children have already made several trains of ten, so they quickly get three tens and six ones. Mr. Thomas then writes +27 underneath the 36. "Before you use the cubes to figure out the answer, think about what it might be. Then use the cubes to check and see. Thumbs up when you know what the answer is." Mr. Thomas watches the children at work and notices them approaching the task in several different ways. He sees that Paul puts out three more tens to make six tens and takes away all but three of the cubes. He had apparently already figured it out without the cubes and just made the cubes match what he believed the answer to be. Angela adds two tens and seven ones and then proceeds to count each cube one by one.

Cilla gets two tens and seven cubes and counts the Unifix trains, "Ten, twenty, thirty, forty, fifty," and then counts the rest, "Fifty-one, fifty-two . . ." until she has counted 62 (having accidentally skipped one).

After a few minutes, Mr. Thomas asks, "Would anybody like to share what they think the answer is?" Paul raises his hand quickly, but Mr. Thomas does not call on him first. He waits until several hands are up.

Angela shares her idea. "I think 63," she says. Cilla says, "I think 62."

"Does anybody have a different idea?" Mr. Thomas asks. No one else wants to share, so Mr. Thomas then asks, "Who would like to share how they got the answer?"

Paul's hand goes up quickly again, and this time Mr. Thomas calls on him. "I knew that 30 and 20 made 50. Then I knew that 6 more made 56. Then I counted 7 more in my head and that made 63."

Suli raises her hand and begins to explain what she did. "I got 62, too, but I did it a different way. Thirty and 20 makes 50. I knew that 6 and 6 is 12, so 6 and 7 is 13. So 50 and 13 is 63."

Angela raises her hand. "I did it a different way. I got three tens and 6 and two tens and 7, and then I counted and it was 63."

Cilla had had her hand up but now is looking again at her cubes and checking to see if she counted wrong.

*Mr. Thomas is pleased that his children can interpret numbers as tens and ones and can find their own ways to figure out the answers. More and more of them are able to think about the problems without their cubes, but because Mr. Thomas has everyone prove their thinking with materials, all of the children have a chance to use the cubes if they need them and are encouraged to make sense of this process. Mr. Thomas is comfortable giving the children the opportunity to find many different ways to deal with large numbers rather than presenting them with one particular way to get an answer. He knows that when he tries to teach the children a rule for getting the answer to problems in one way, they often get confused and follow rules without necessarily understanding the reasoning. He wants them to trust their own thinking, as well as listen to others' ways of doing things.*

## Measurement

Measurement for the young child is an important way to look for relationships in the real world. Children are interested in how big, how tall, and how much. Children will first find ways to make comparisons directly by standing back to back to see who is taller or pouring rice from one jar into another to see if it will spill or come up short. The need to actually measure arises when children want to make comparisons between objects that cannot be directly compared. They first need to determine what they are trying to find out—do they want to know how long or tall something is, how much space it takes up, how much it holds, how heavy it is? Whatever attribute they are measuring determines the kind of unit they can use. Children should have opportunities to *figure out* their own ways of measuring, using a variety of units, before being asked to work with standard units. Standard units are just one way of measuring, using units agreed upon by society.

A group of 5-year-olds are snapping Unifix cubes together, attempting to make trains just as long as they are. Donny snaps cubes together until he figures the train is long enough and ends up with a train a foot or so longer than he is. He lies down beside the long train and exclaims, "This is 20 feet longer than I am!" The teacher asks Joe if he would like to measure himself with the cubes. Joe responds, "Measure myself? I already know how big I weigh. I weigh 61."

*These children show that they know something about the kinds of words that are used when people measure, but they are not yet able to use those words accurately.*

Several first-graders are measuring things in their classroom. They are using toothpicks, large paper clips, Unifix cubes, and Popsicle sticks. Gene is lining up toothpicks on the table. He leaves spaces between some toothpicks and overlaps others. Lynn begins measuring the table as Gene finishes his task. Lynn is very careful, making sure that each toothpick touches the end of the one next to it. Soonja is snapping Unifix cubes together to measure the rug. She appears unconcerned that her Unifix train is far from straight.

*When young children begin to use units to measure length, they often are unaware that the units must be uniform, that they must line up end to end, and that they must be lined up as straight as possible. The teacher has deliberately not coached the children to do it "right" because she knows that this would not help them understand why such things matter and would be something that they would try to do just because "teacher said." Instead, she intends to have the children discuss why they think Gene and Lynn got different numbers when they measured the table with toothpicks. She supports their construction of understandings by asking them to make some conjectures about what kinds of things might happen when they get different numbers and then having them test their theories.*

A group of second-graders are making shapes with lengths of yarn and then finding out how many tiles fit inside the shapes. The teacher's main purpose is to get the children working with large numbers so that they might begin to see the usefulness of organizing

into groups of tens and ones. The children are exploring number at the same time they are getting some experiences with the relationship between area and perimeter. The teacher notices that Paula made a long, narrow shape with her yarn. Paula looks up and comments, "I knew this shape would not hold very many and I wouldn't have to count so high."

Her teacher then asks, "What kind of shape do you think you would have to make if you want it to hold the most tiles?"

Paula surprises her teacher by responding quickly and confidently, "It would have to be a circle."

"Why do you say that?" her teacher asks. "Because a circle is the most spread out, so the most would fit," Paula replies.

*The teacher does not expect anyone to really understand or come to any conclusions about maximizing the area for any given perimeter, but she knows it would not hurt to pose the question. Much to her surprise, Paula has an intuitive understanding of a concept she (the teacher) just figured out in a math class she is taking. Children often are capable of more than we expect. The teacher does not want to assume ahead of time what a child may or may not understand.*

### *Patterns and relationships*

The search for patterns is the search for an underlying structure in whatever situation we find ourselves. When we see patterns, we feel some security and confidence in knowing what comes next, in being able to predict beyond what we can see. Patterns can be experienced in a variety of ways, not only in numbers but in motions, designs, and arrangements and in recurring events, such as the seasons and the days of week. The order and structure that is present in our number system is revealed when we begin looking for patterns. Children need to be able to recognize, create, and interpret patterns. They need to use their understanding of pattern as a tool for solving problems and making predictions.

The children in Mrs. Dorsey's preschool class experience patterns through music. They become aware of rhythm and repetition when they march around the room, tap their rhythm sticks, or beat on their drums. Mrs. Dorsey reads books with repetitive language patterns that allow the children to make predictions. One of the favorites is Bill Martin's *Brown Bear, Brown Bear.* The children love to join in as she reads, "Brown bear, brown bear, what do you see? I see a yellow duck looking at me." They delight in guessing what comes next. Mrs. Dorsey notices and points out patterns on their clothing, using the language she wants them to become familiar with. "I see a pattern on your shirt . . . look—red, green, white; red, green, white." Timmy seems especially interested in patterns. Today he lines up colored cubes and calls out to her, "Look, I made a pattern."

*To Mrs. Dorsey, working with patterns seems like such a natural thing to do in preschool. She wants the children to develop an awareness of pattern, but she does not really expect them to be able to produce patterns on their own. As happens so much of the time, Timmy and other children become interested in exploring ideas on their own after she has introduced the ideas.*

Mrs. Brown gathers her class of kindergarten children in a large circle on the floor. She moves around the circle, dumping out colored tiles as she goes. "Now, join in with me as I do a pattern." She begins clapping her hands and tapping her shoulders and knees in the following sequence: "clap, shoulders, shoulders, knees; clap, shoulders, shoulders, knees." The children join in as they begin to get the idea of the pattern. Most of the children (but not all) are able to reproduce the pattern accurately. Mrs. Brown asks the children, "How would we describe this pattern with ABC's?"

As the class continues to do the pattern, a few of the children begin to chant "ABBC, ABBC, ABBC," and the rest join in with them.

"Now I want you to make this ABBC pattern with the tiles," Mrs. Brown says. Little hands reach out for the tiles and begin to line them up. Mrs. Brown watches them and notes a variety of responses. Jill has lined up green, yellow, yellow, blue; green, yellow, yellow, blue. Peter and Lee are working together to make red, green, green, blue; red, green, green, blue. John is randomly lining up tiles, not seeming to pay any attention to the colors he is using. JueMay is alternating green and red. After allowing a few minutes for the children to work, Mrs. Brown asks them to stop and share some of the patterns. "Let's look at Jill's pattern."

Mrs. Brown has Jill point at her cubes as the children chant, "Green, yellow, yellow, blue," and so on. Mrs. Brown continues the activity by having three more children share their various correct interpretations of the pattern.

*Today Mrs. Brown is working with her whole class at once and expects to see the children functioning at a variety of levels. She is comfortable with this because she knows that the activity has something for all of the children. Some children*

*will be challenged to interpret the pattern in a creative and novel way. Other children will be challenged simply to interpret the pattern correctly. Others will be coming to an understanding of pattern and will not realize that the pattern they make is not what was expected until they see other children's interpretations. However, it is through seeing what the other children do that they will learn. Others will still be unable to create a pattern themselves but will have one more opportunity to experience pattern ideas. Mrs. Brown does not point out those patterns or attempts that are not what she had in mind; she lets the children come to this awareness on their own by comparing what they did with those to which she calls attention. Her responsibility is not to tell them that they are wrong but to plan additional experiences that will help them decide for themselves whether they are wrong or right. During the next few weeks, she will present this same challenge many times. Next time she will probably give a simpler pattern so that those children who are close to understanding will have an easier pattern on which to try out their thinking. Another time she will change materials. Using tiles that are all alike will force the children to look at position as a way to vary the pattern. Using a material such as buttons will pose a different problem because the children will have to think harder to decide what attributes would work, given their specific set of buttons.*

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Mrs. May's second- and third-grade class has been discovering the number patterns that emerge when they count by twos, by fives, and by threes and have colored in those patterns on 00–99 charts. They have been investigating where those patterns occur in the real world. They have discovered patterns for counting eyes, fingers, and sides of triangles. Mrs. May poses a new problem for them to investigate today. "How many children do we need to turn 6 jumpropes? What if we had 30 jumpropes? How can we find out?"

*Mrs. May wants the children to see the power of pattern as a problem-solving tool. Once children figure out the pattern, they will be able to tell her the number of children needed for any number of jumpropes. Besides having them experience the use of pattern for problem solving, Mrs.*

*May also wants the children to begin seeing the connections between patterns, and she knows that the children will see the same pattern emerging as when they counted eyes. Becoming familiar with these patterns will also help the children see patterns when they work with multiplication.*

### *Statistics and probability*

Statistics involves children in answering real questions from the real world. "Instead of doing mathematics as an isolated set of skills unrelated to the world of reality, students can understand statistics as the vibrant study of the world in which they live, where numbers can tell them stories about aspects of their own lives" (Russell & Corwin 1990, 2). Children engaged in statistics gather information and then organize it to see relationships, patterns, or trends.

The children in Mr. Shimmerer's preschool class put their picture on an attendance graph each morning as they come into the classroom. Today they indicate their choice of snack. Do they want apples, peanuts, or raisins? After everyone has made his or her choice, Mr. Shimmerer asks Kyle to count each column so he can prepare for snacktime. Six people want apples and six people want peanuts. Mr. Shimmerer notices that Kyle counts each group of six, not trusting the numbers to be the same. Gene is watching and jumps in to tell Kyle, "Seven people want raisins. See, there's just one more." Kyle looks up at Gene but then proceeds to count the seven pictures, to make sure for himself.

*Mr. Shimmerer wants the children to have experiences collecting data, so he often comes up with the question and sets up the graph for the children. The children focus on the numbers and the relationships between the numbers.*

Mrs. Ward's second-grade class plans a poetry night at school and invites the parents to come. Mrs. Ward's husband volunteers to take care of any younger brothers and sisters that might come along with the parents. The children start a discussion about how many children that might be if everybody's younger brothers and sisters come. Jon is the youngest in his family, so he is not as interested in the number of younger brothers and sisters, but he wants to know how many kids there would be altogether if all the brothers and sisters came. Other children raise other questions about family members and soon decide that there are many possibilities for collecting data. Some of the questions posed are, How many children are in your family? Do you have a younger brother or sister? How many younger brothers and sisters do you have? How old are the brothers and sisters in your family? Are there more boys or more girls in our families? Mrs. Gregg lists all the questions on the board and lets the children choose the question they are interested in pursuing. She then divides them into teams to gather and organize their data.

*Earlier in the year, Mrs. Gregg set up graphs for questions to which she asked the children to respond. She asked questions such as "What is your favorite season?" and had the children draw a small picture of their favorite season and put it in the appropriate place on the graph. Now she is intrigued with the children's level of interest in the questions they generated about their families and wants to involve them in deciding how to collect, sort, and display the information they have gathered. She is not sure how they will carry out the task, but she is willing to give them a chance to work on the problems in their own way. Through observing the children attempt a task, she learns what kinds of information and help they need.*

## Geometry and spatial sense

Geometry helps us look more closely at the physical world in which we live. The language of geometry gives us a way to describe and analyze that three-dimensional world. We notice the properties of various shapes and figures. We start by looking at the whole and then begin to notice specific attributes. We begin to notice what fits together and what does not. We see how shapes go together to make other shapes. We become aware of what changes and what stays the same when direction or position or size is changed. Familiarity with geometric figures and relationships can best be developed through hands-on experiences that require children to identify similarities, differences, and relationships.

To convey a better sense of how developmentally appropriate experiences might develop in classroom settings for children of different ages, we look at the geometry experiences in classrooms for three different age levels and at each teacher's planning and decision making in relation to geometry in the curriculum (see pp. 36–40). These examples illustrate the ways in which teachers create awareness, encourage exploration, and support children as they move toward conventional understanding of mathematical concepts. The examples also illustrate how teachers assess children's learning, how teachers apply what they know about appropriate expectations, and how children develop math concepts.

### *Example 1: Preschool (3- and 4-year-olds)*

Monday morning has officially begun. The children have been arriving in groups for the past 20 minutes. As they arrive, they take care of any routine procedures, then they choose activities at various centers around the room. This has been the procedure since last September, and by now all the children, even the youngest, can make some choice to begin the day.

Ms. Lusby glances around at the children. She has been paying attention to their geometric understandings over the past few days. As she approaches the block corner, she notices that Mark and Jamal seem to be engaged in building towers. They are testing various blocks to see if they will stack together. Jamal knows that those with flat sides work best and is conveying this information to Mark. Mark is not quite convinced and tries other blocks but finally settles on the flat-block theory, too. Jen is building small houses. Most have flat roofs, but others have pitched roofs. The use of the triangular blocks seems to be a new discovery for Jen that she is eager to share with Ms. Lusby. IChin is working next to Jen, but she is just putting blocks into piles. Ms. Lusby watches but sees no organization in the piles. Ms. Lusby asks IChin to tell her about the piles she made; from their conversation Ms. Lusby finds that her initial assessment was correct. Manuel is also gathering blocks, but there seems to be some organization to his gathering. He tells Ms. Lusby that he is putting all of the shapes that look like boxes in one pile, the shapes that look like cans in another, and so on. Ms. Lusby helps Manuel label his groups in a new way by providing new terminology, such as *cylinder* and *cube.* When asked what he intends to do with the blocks, Manuel answers that he is preparing to build a garage for his fleet of trucks.

Ms. Lusby moves on to the art area. Several of the children have been involved in collage projects for the past few days, and once again they are hard at work. Joan and Michael have been covering a large paper with material of different shapes and textures. It has been obvious that one concern of theirs was to get as many pieces of material as possible on their paper. As Ms. Lusby approaches she hears Joan talking about which material shapes need to be glued on next and how she is going to turn them to fit the spaces left on her paper. Michael looks at Joan's paper but is too engrossed in his own planning to do more than nod. Rex is working on a project across the table from Joan but is doing no planning at all. His material pieces are sometimes overlapping and sometimes spaced apart. He is not worried at all about doing any fitting. Gina is at the easel and is making blob shapes. She is very organized in her work. First she uses one color, then another. She is very carefully seeing to it that all the paper is being covered with a design.

As Ms. Lusby moves toward the science area, she notices that some children have taken the pattern blocks off the shelves in the back of the room and have moved them to the carpeted area. There they dumped out the tub and gathered the blocks that they want. Craig and Carly are working together to cover a part of the carpet. They are joining the blocks together so that they touch without leaving any spaces. They started with yellow hexagons but, having run out of this shape, are seeing what other blocks will fit together to accomplish the task.

*Ms. Lusby has taught preschool children for seven years. In this time she has learned that children come to school with notions about geometry based on interaction with their three-dimensional world. She has found it important to set up an environment where that interaction can continue both to build further awareness and to allow for more sophisticated exploration.*

*Because geometry involves ideas about shape, size, space, position, direction, and movement, Ms. Lusby is able to use traditional activity centers to facilitate this interaction. The block center can serve to familiarize children with common three-dimensional shapes and to allow children to explore the properties of those shapes. The art center gives children the opportunity to explore the filling of two-dimensional space and notions about position, movement, and direction of movement. Filling common containers, such as boxes, cartons, or tins, gives children more opportunity to explore the filling of three-dimensional space. The housekeeping center gives children further practice with filling three-dimensional space, as well as the opportunity to explore position and movement of solids.*

*Although it is important to provide opportunities for exploration, Ms. Lusby also knows that this is not enough. Tying language to action allows children to label ideas and to communicate with others in a precise way. The teacher often is the one who must initially supply the language and then engage children in conversation*

### *Example 1 (cont'd)*

Donnell is trying to stack his blocks, but they keep falling over. He does not seem to know what adjustments he has to make to complete the task and seems ready to put his blocks away in frustration. Ms. Lusby stops to ask Donnell if it would be helpful to build a wider base, but he ignores the question and starts talking about his new puppy. Troy and Germaine are building roads with their blocks. They brought Matchbox cars to school with them today and intend to use the road for their cars. They have trouble fitting the white parallelograms into their roads and decide to leave those out. Kate and Rachelle are building several designs with their blocks. Ms. Lusby notices that each of the designs is symmetrical. She thinks about stopping to talk to the girls about this observation but decides to give them more time to build other designs instead. There will be other times to focus on symmetry.

A quick stop at the science/discovery area shows children involved in filling containers. Ms. Lusby is pleased that children seem interested in filling three-dimensional space as well as two-dimensional space. Leanne is trying to find out how many cubes will fill a little jewelry box. Indira is working on a candy box. She is sure that her box will require more cubes to fill the space and is trying to prove it to Leanne. Ms. Lusby asks the girls why they chose the cubes to fill the boxes rather than the other the shapes. Indira explains, "I could fit more in." Leanne looks puzzled but nods in agreement to Indira's answer.

It is about time for the children to clean up, so Ms. Lusby stops at the housekeeping center to suggest that they get a head start. Surprisingly, they have already started the process. Ben and Pete restock the cupboard shelves. Pete shoves in containers as fast as he can while Ben rearranges the boxes and cars so that they all fit neatly.

*that focuses on their exploration and requires them to also use the language. Ms. Lusby recognizes the need to ask questions that might lead children to that next level of exploration, but she allows them to ignore the question if they are not ready to consider it.*

*Ms. Lusby knows which concepts and relationships (such as symmetry) she wants the children to explore. She knows that the opportunity to look at these relationships will come up naturally, so she is willing to wait for the right time. She trusts this decision because she has carefully created an environment in which certain materials and tasks are available to the children. She has established an atmosphere in which questioning, noticing, and looking for relationships are encouraged.*

### *Example 2: Primary grades (5- and 6-year-olds)*

It is after lunch, and the class is just getting settled on the rug. Mr. Harris has brought a collection of cartons, boxes, and cans to school and is displaying them in the middle of the rug. When he finishes he asks the children to look at the containers carefully and tell him what they notice. Joe is the first to speak. "Well, some of them are made of paper and some are made of metal." Mr. Harris records this information on the chalkboard. Sue notices that some of the containers have flat sides and others do not. Before Mr. Harris records this information, he stops to tell the class that mathematicians have a name for the flat sides. They are called *faces*. The children laugh because they think it is silly to have faces without eyes and noses, but they like the word *faces* and have Mr. Harris record Sue's observation using their new word. Bob tells Mr. Harris that some of the containers have six faces and others have fewer than six. This fact is also recorded. Mr. Harris continues to record ideas until the children seem finished.

During this process some questions come up. Marcus wonders out loud if there could be a shape without any faces. He has already discovered that the cone shape has only one face. Then Leticia remembers that the shapes that look like square boxes are called *cubes*, and she asks whether the other container shapes have names. Jill thinks that she

*Mr. Harris spent much of the first week of school watching his class interact with materials and ideas. From the notes he took on each child, he assumed that these children had had previous opportunities to explore informally many geometrical ideas. He is pleased that previous teachers recognized the importance of this.*

*Because of the children's background, Mr. Harris decides to set aside a formal time for mathematics over the next two weeks so that the children can begin to explore specific topics and relationships in geometry. While he knows that math textbooks*

### *Example 2: Primary grades (5- and 6-year-olds) (cont'd)*

has containers at home with different shapes and suggests that the class bring more shapes from home. The children seem to like the idea.

Mr. Harris interrupts the children to ask them to focus on one of the statements written on the board. "You said that some of the containers have six faces and some have fewer. Can you find a container that has fewer than six faces?" Jeff points to one of the cans. He tells Mr. Harris that the can has two faces. The other children agree. Mr. Harris asks the children to find all the containers with two faces, and those containers are grouped together. The children continue until all of the containers have been grouped by number of faces. Mr. Harris labels the groups, using first the names the children use naturally, then the names that mathematicians use when talking about the shapes. Mr. Harris takes a picture for a record of the work the children have done.

The last thing that Mr. Harris does before moving on to other topics is to ask the children to each bring three containers from home the next day. He has prepared a note for the children to give their parents. He reminds the children to look for containers with different shapes. The children seem eager to do this.

When the children arrive the next day, Mr. Harris has already prepared a spot for the containers. As the children arrive they gather around the containers and talk about what they see. One of the children has brought a shape to school that is a toy, not a container. The children laugh when they see the ball. Now they know about the shape without any faces. Marcus shakes his head and wonders why he did not think of a ball shape yesterday. The children are quick to notice any shape that looks different from the containers Mr. Harris brought to school. The discussion seems to focus on the number of faces each new shape has. Mr. Harris is pleased that the children are using some of the vocabulary introduced the day before.

When math time arrives Mr. Harris gathers the children on the rug. They discuss the new shapes that were brought to school. The discussion turns out to be a replay of the informal discussion that occurred before school started. The children do not seem to mind. They are eager to share their shapes again.

As the discussion winds down, Mr. Harris explains what the children will be doing in math today. They will be working in groups of three. Each group is to take their shapes and find a good working place in the room. Then they are to sort the shapes in as many ways as possible, recording the ways as they find them. Mr. Harris leaves the recording methods up to the children. He dismisses the children one group at a time until all of the children have left the rug. Most of the children settle down to the task right away, but two of the groups need some assistance. Once Mr. Harris has helped those groups find a spot and offered some suggestions for getting started, he looks around the room. The noise level settles down to a busy hum, and Mr. Harris is free to wander through the room listening to conversations, intervening when his help is needed, providing more labels if it seems appropriate, and asking questions to focus attention on specific properties of the shapes.

Felicia, Jill, and Jordan have found several ways to group the shapes. They have used some of the ideas collected on the board the previous day but have discovered several more on their own. They just finished

*often begin geometry with two-dimensional shapes, he decides to begin with three-dimensional shapes. He realizes that this is what children have had the most experience with, so this is where structured exploration should begin. Mr. Harris does not consider himself an expert on mathematics, but he has learned a lot about children in his 15 years as a teacher; beginning with what children intuitively know makes sense to him.*

*One of Mr. Harris's goals is to find out what children already know by having them verbalize what they notice about three-dimensional shapes. Another goal is to focus the children's attention on the properties of the more common shapes and to attach new vocabulary when needed. From exploration of three-dimensional shapes, he hopes to move on to two-dimensional shapes by stamping the faces of three-dimensional shapes and slicing them in different ways. From there he may move on to covering two-dimensional space and seeing how various two-dimensional shapes are related.*

*In planning activities for the children to engage in, Mr. Harris is aware of the different levels of understanding among the children in the class, and he tries to pick activities that allow entry to all children. The activities must also have the potential of pushing children to construct new understandings and generalizations, even if these generalizations are not correct in conventional terms. Mr. Harris recognizes that even incorrect generalizations indicate growth in a child's understanding.*

*Example 2 (cont'd)*

grouping their shapes by those that roll and those that do not roll. Mr. Harris notices that they have recorded their ideas by writing down the categories. These three children are very comfortable with writing and have no trouble inventing their own spelling.

Jerry, Cho-Rong, and Lee seem stumped. They have sorted their shapes in two ways, using ideas listed on the board the day before. They cannot remember what else was listed and cannot get past this obstacle. Mr. Harris refocuses their attention on the shapes themselves, and Lee notices that some have corners and others do not. The two boys seem pleased with this idea, and the children begin to sort. Beth, Dan, and Paul are working well and are in the process of recording a new grouping. They choose to draw pictures to record their ideas. Mr. Harris notices that these children have organized their paper by folding it back so that they have four sections on the front and four on the back. Other groups are not that organized. When Mr. Harris notices a restless hum, he decides that it is time to gather the children again on the rug.

Mr. Harris asks each group to share one of the ways they sorted the shapes. He purposely begins with those groups who found the fewest so that they have something to share for their turn. The children are interested in the ideas of the other groups; and they ooh and ahh appropriately when a group shares an unusual idea.

The math period the following day is a short one, as Mr. Harris has planned. He again sets out in the middle of the rug area some of the three-dimensional shapes the children have been exploring. The children once again gather around. Mr. Harris explains that today they are going to play a guessing game. He will start the game by pretending to be trapped in one of the shapes. He cannot say a word. He can only act out what it would be like to be trapped and trying to get out. Mr. Harris tells the children that once they think they know which shape he is trapped in, they are to raise their hands.

Mr. Harris begins his pantomime. Hands go up at once, but he continues. Several of the hands go down. The children watch intently, often thinking that they know which shape he is in but then reconsidering as they receive further clues from his actions. Finally, most of the children have a hand in the air. Mr. Harris calls on Jeff, who points to the cube. Mr. Harris waits until Jeff has named the shape. Jeff answers, calling the cube a "box." Mr. Harris then wonders out loud what mathematicians would call the shape. Several hands go up, but Jeff calls out "Cube!" before Mr. Harris has a chance to call on anyone.

Now it is time for one of the children to have a turn at being the mime. Mr. Harris carefully selects Judy to be first. He knows that Judy is not shy in front of the other children and has a flair for acting. The children watch intently as Judy picks out important properties of the shape she is thinking of and conveys these properties through movement. She moves around in a circular motion and moves her hands to show the flat top of her shape. It doesn't take long before most hands are in the air and the children again have the chance to use the language of geometry, as several call out, "Cylinder!" The other children each have a chance after Judy. Then it is time to stop. Mr. Harris tells the children that he will leave the shapes out so that groups of children can continue the activity during other times of the day.

*Mr. Harris understands that one of his key roles as a teacher is to provide opportunities for children to think about geometrical ideas, as well as opportunities to talk about those ideas with him and with other children. He also realizes that he is the one who can expand the language that the children already have so that they can be more precise when talking about geometry. The integration of writing and mathematics happens naturally when children are allowed to find their own ways to record what they discover.*

*Mr. Harris does not feel a need to keep to a rigid timetable when planning mathematical experiences. Today a short period will do. Another day he may need a longer period of time to accomplish his goals. Furthermore, he knows that although he can structure the environment, he must allow children some choice in how they explore that environment and in how they record what they discover.*

### *Example 3: Classroom experience (7- and 8-year-olds)*

Mrs. Mitchell's group of 7- and 8-year-olds knows that after recess they usually have the chance to be mathematicians, and they look forward to this part of the day. Over the past week or two, they have focused their attention on geometry. On some days they worked in small groups to explore mathematical ideas. Other times they worked independently on tasks set up around the room. Still other days they participated in teacher-directed activities, with Mrs. Mitchell demonstrating and the children participating by looking for relationships, communicating those relationships, and sometimes proposing rules, generalizations, or definitions related to the relationships they thought existed.

Today Mrs. Mitchell and some student helpers are setting out boxes of straws and hairpins at each of the tables (children in this class sit at tables in groups of three or four). The children wonder what they will be doing with the straws and converse about this as the materials are being distributed.

When all of the tables are supplied, Mrs. Mitchell tells the children that today they will make some two-dimensional shapes out of straws. In particular, they will make some quadrilaterals. Most of the children look puzzled, but Sean remembers that quad means four and asks if a quadrilateral is a shape with four sides. Mrs. Mitchell tells Sean that he is right, and she goes on to say that the children will make a specific kind of quadrilateral—a rectangle. The children giggle. Gayle tells Mrs. Mitchell that they all know about rectangles. They just did not know that rectangles were also called quadrilaterals. Several of the children tell Mrs. Mitchell that they know all there is to know about rectangles and are not sure that, as mathematicians, they need to explore rectangles any further. Mrs. Mitchell tells the children that because they are mathematicians, she has a problem for them to explore. She wants them to make as many different rectangles as they can, using the straws and hairpins. The only rule that the children have to follow is to make sure that each rectangle they make is different from any previous rectangle they have made. Mrs. Mitchell asks them to work in their groups to explore this problem.

The children are still not quite sure they need to do the problem, but using straws and hairpins to make shapes intrigues them. Because Mrs. Mitchell has not shown the children *how* to use hairpins to connect the straws to make shapes, the children begin to experiment. Tyler is the first one to figure out how to do it, and he begins to pass the word. Mrs. Mitchell watches with interest. She was quite sure this would happen, and that is why she chose not to be too specific with her direction.

Mrs. Mitchell plans to give the children only about 10 minutes to come up with some rectangles. She wants to spend most of the time investigating what she hopes will be interesting relationships between some basic two-dimensional shapes. When the time is up, she asks for the children's attention. She asks if any of the groups is willing to bring up one of their shapes to share with the class. Carlos volunteers and reaches for one of the shapes that he and Josh have made. As soon as Carlos picks up the shape, the straws wiggle loose and he no longer has a rectangle. The other children giggle and so does Carlos. Mrs. Mitchell gives Carlos some tape and asks him if he could tape his shape on the board so that it is a rectangle again. Mrs. Mitchell asks the children if they think it is possible for Carlos to make a rectangle shape on the board with his quadrilateral with only two pieces of tape. While the children discuss this, Carlos and Josh get to work.

*Mrs. Mitchell knows that the children in her class have no difficulty identifying basic shapes. For some of the children, this has been the focus of their geometry learning at school. Fortunately, these children are in the minority, because as teachers become more aware of mathematics as a discipline, they provide opportunities for children to explore geometry in a problem-solving setting. In such a setting naming the shapes is not a focus but evolves naturally as children find a need to label their discoveries.*

*Although children can label shapes, they often have not focused on relationships within and between shapes. Mrs. Mitchell hopes that because the children will be using a new material, straws, she will be able to hook them into exploring basic shapes one more time. This time she hopes to engage the children in developing their own definitions for shapes. In addition, her goal is to help children discover the relationship between shapes—in particular, quadrilaterals, such as rectangles, squares, parallelograms, and rhombuses.*

*Understanding these relationships takes time. Mrs. Mitchell knows that for many children the experience over the next few weeks will just plant the seeds. Other children will make sense of these relationships and use this information to discover other relationships. Mrs. Mitchell's job will be to watch and listen for clues to each child's understanding, then use this information in planning future lessons.*

***Example 3 (cont'd)***

In no time at all, Carlos and Josh finish by taping the two diagonal corners of the rectangle on the board. Mrs. Mitchell asks the children if the shape taped to the board is a rectangle, and the children indicate that it is. Mrs. Mitchell asks for four more volunteers to bring up their rectangles and tape them to the board. The only criterion is that each rectangle must be different from all the other rectangles on the board. The rest of the class must make sure that each rectangle is different.

When all five rectangles are up, Mrs. Mitchell asks the children to examine each of the shapes and, with a partner, write a definition for a rectangle. When the children finish, she asks for volunteers to read their definitions. Jillean reads, "A rectangle is a shape that has four sides. The sides across from each other are the same size." Mrs. Mitchell asks if anyone has anything to add to Jillean's definition. No one does. So Mrs. Mitchell holds up a shape (a parallelogram) that fits Jillean's definition and asks if that is a rectangle. The children indicate that it is not because it does not have square corners. So the children add that criterion to Jillean's definition. Mrs. Mitchell then reads a definition of a rectangle that mathematicians agree upon so that the children can see if it is the same as theirs.

Next Mrs. Mitchell asks each child to make a square. If they have time, they can make another square while waiting for all of the children to finish. Mrs. Mitchell watches while the children complete their squares. When everyone has made a square, Mrs. Mitchell asks the children if a square is a rectangle. Before anyone has a chance to answer, she asks the children to talk it over with their partners and be ready to give a convincing argument for their answer. Kye-Sun is the first to volunteer an opinion. He tells his classmates that he does not think that a square is a rectangle because in a rectangle two of the sides are longer than the other two sides. Maria raises her hand. She tells the class that she thinks that a square is a rectangle because the definition of a rectangle does not say that all sides cannot be equal. There is a murmur through the class. They had not thought of this point. Several of the children are not convinced, however. The class decides that they need to research rectangles further to see if they can find other definitions.

Mrs. Mitchell tells the children that their assignment for the night is to do just that. The class discusses where they might look for these definitions. Several ideas arise, including dictionaries, math textbooks, and mathematicians. As a reminder, the children write the assignment in their assignment notebook. Then Mrs. Mitchell asks them to place the shapes they have made on the counter in the back of the room and put the rest of the materials back on the shelf. They will be using the quadrilateral they constructed in future lessons.

*Learning to express their thinking in writing can become an important part of developing mathematical understanding and is a natural way to integrate mathematics and language arts. When children are asked to come up with their own definitions, they need to think for themselves about what the important attributes of a shape are and are not. Rather than telling the children what is wrong with their definition, Mrs. Mitchell shows them a parallelogram so that they can see for themselves that the definition is incomplete. Again, Mrs. Mitchell is asking the children to think for themselves and to discuss and defend their thinking, rather than simply telling them the answer.*

## Planning developmentally appropriate mathematics experience

If teachers begin to see mathematics as a tool for exploring and making sense of the world, they will see opportunities for mathematics as a part of the study of many topics. Teachers and children will see how mathematics helps us understand, organize, and analyze our experiences in science. They will see the connection between mathematics and music as they explore rhythm and pattern. They will see the relationships between mathematics and art as they work with symmetry and design or with filling space. They will use mathematics when building and creating. They will gather and organize data in order to understand situations and to solve problems. Teachers and children will discuss, read, and write mathematics.

However, looking for mathematical relationships in art or music or using mathematics as a tool for exploring our world does not mean that we should allow mathematics to become an incidental part of the curriculum. The mathematics that children explore does not have to be applied in a real-life situation to be meaningful to children. There is richness, power, and beauty in the study of mathematics itself that was not there for many adults who experienced mathematics as rote memory of isolated skills. It is meaningful and potentially engaging for children to explore mathematics, for example, by finding as many ways as they can to make four-sided figures on a Geoboard or looking for patterns on a 00–99 chart.

Teachers must set aside time specifically for the study of mathematics and be purposeful in planning experiences that help children develop specific mathematical understandings. Teachers must identify those concepts that they want children to work with and make sure that children have opportunities to explore these ideas. Often children need multiple experiences in various settings to form generalizations and develop concepts.

## Conclusion

In many ways we are on the threshold of developing a whole new way of teaching mathematics to young children. We spent many years trying to teach children in ways that did not consider how they learn or the nature of mathematics. We taught children to memorize rote procedures and to parrot back "right" answers before they were able to understand them. The result has been a population that avoids and even fears mathematics. If, instead, we respect young children's ways of thinking and exploring the world, we will give them the time it takes to learn and grow and build a foundation that serves them in the future.

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# 5

# Transforming Science Curriculum

*Sally J. Kilmer and Helenmarie Hofman*

*It is curiosity, the drive to make sense out of something in our surroundings, that causes children to reach out, touch, and wonder and it is curiosity that moves scientists to do the very same thing. (Abruscato 1992, 3)*

Science for young children is not what most of us remember from our school days—memorizing definitions and lists of seemingly meaningless principles. Science is much more dynamic—observing, wondering, and finding out what happens when something is changed. Science is what children do every day as they ask questions, observe ants, make ice cubes, ride a bicycle, sharpen a pencil, push a chair out from a desk, make a snowball, feed a cat, pound a nail, or turn on a light. By increasing our awareness of the importance of science to individuals and society, early childhood teachers can take greater advantage of opportunities to identify, encourage, and extend children's science skills and knowledge.

This chapter provides a framework for the development of a science curriculum that is appropriate for young children from various backgrounds. Specifically, we will identify

1. goals for science for processes and content for 3- to 8-year-olds, based on goals proposed by the National Center for Improving Science Education (NCISE 1990) and the Benchmarks for Scientific Literacy developed by the American Association for the Advancement of Science (1989, 1993);
2. a developmental range of experiences that address these goals;
3. implications for teaching strategies and learning environments; and
4. suggestions for assessing children's understanding of scientific methods and phenomena.

This framework reflects current conceptions of science and recommendations for science education by scientists and science teachers, as well as theory and research about young children's cognitive skills and science knowledge acquisition.

## What is science?

Science is usually defined by delineating the content, procedures, and assumptions of the field. Science includes both knowledge about specific phenomena (characteristics, classifications, and principles that explain the universe) and the general strategies or processes used to collect and to evaluate such information. Technology, the application of science to problems of human adaptation to the environment, is currently included as a third aspect of science (American Association for the Advancement of Science 1989, 1993; NCISE 1990; National Research Council 1994).

Science is based on the assumption "that the things and events in the universe occur in consistent patterns that are comprehensible through careful, systematic study . . . that through the use of the intellect, and with the aid of instruments that extend the senses, people can discover patterns in all of nature" (American Association for the Advancement of Science 1989, 25). Discoveries or explanations of nature must be supported by evidence and must be verified by multiple investigators before being accepted. Science is not static, however, and previously "accepted explanations" are frequently modified by further evidence. Although scientists strive for accuracy and precision, they must, maintain open, questioning, creative minds and be willing to consider additional information and/or different ways of viewing phenomena.

## Developmentally appropriate sciencing goals for early childhood

The overall purpose for learning science is to acquire "scientific literacy," to develop an understanding of the nature of science and technology (both strengths and limitations) necessary for survival in the 21st century. Scientific literacy encompasses an approach to identifying and solving problems based on logic, not on the memorization of facts. In order to participate in important decisions regarding the natural environment, energy sources, uses of technology, and other issues that affect all of society, citizens must have some basic understanding of science and technology. Scientific literacy also offers individuals the potential benefits of increased economic productivity and an approach to personal decision making (National Research Council 1994).

The contribution of early childhood education toward scientific literacy is to lay a solid foundation for the continuing development of an interest in and an understanding of science and technology by ensuring that every child—regardless of gender, racial or cultural background, or disabilities—actively participates in science experiences and views himself as successful in this endeavor. (In this chapter we use the term *sciencing*, which conveys the child's active involvement in learning about science and points out the emphasis on process. Sciencing is a "hands-on, brains-on" undertaking.)

The first three goals suggested by the National Center for Improving Science Education (NCISE 1990) offer a general framework for early childhood science. Although they were recommended for kindergarten through sixth grade, the goals are broad enough to serve as guidelines for planning experiences for preschool children as well. The goals are comprehensive in that they address attitudes, process, and content, and they represent current trends in science education. Specifically, the NCISE-recommended goals are to

- develop each child's innate curiosity about the world;
- broaden each child's procedural and thinking skills for investigating the world, solving problems, and making decisions; and
- increase each child's knowledge of the natural world. (NCISE 1990, 9)

A brief discussion of each goal and related objectives will clarify the parameters for sciencing with 3- through 8-year-olds. An overview of the goals and objectives, with an identification of the types of experiences and expectations that are appropriate for young children, is shown in Table 1.

### *Developing children's innate curiosity about the world*

This goal focuses on attitudes, values, and dispositions related to science. The basic outcome should be an eager, honest learner who is inclined to apply sciencing skills and knowledge to personal and social decisions. The important objectives to foster during early childhood are an interest in and willingness to investigate unfamiliar objects and events; an appreciation of and respect for all living organisms, including humans; and a recognition of the beauty and orderliness of the environment.

### *Broadening each child's procedural and thinking skills for investigating the world, solving problems, and making decisions*

The processes and skills constituting the scientific method are the basis of this goal. These processes are more important in the early years than are specific science knowledge or facts. They are not only critical for science but are the components of logical thought applicable to any discipline or experience. We use these processes spontaneously as we notice things and make a multitude of decisions throughout each day. They are the types of behaviors described by Piaget (1971) and are the foundation of the learning cycle presented earlier in this volume (pp. 19–21). Increasing the awareness of and skills used in scientific procedures should enhance thinking in general.

Although the exact label for a process varies in different sources, the behaviors identified generally include the following, which were adapted from *Science Framework Addendum* (1984):

## *Table 1.* Goals and Objectives for Sciencing with Young Children

***Goal:* To develop each child's innate curiosity about the world**

***Objectives:***

Each child

- shows interest in and a willingness to investigate unfamiliar objects and events;
- shows respect for all living organisms, including humans; and
- shows appreciation for the beauty, balance, and orderliness of the environment.

***Goal:* To broaden each child's procedural and thinking skills for investigating the world, solving problems, and making decisions**

***Objectives:***

Each child

- eagerly, actively participates in sciencing.;
- uses senses appropriately to learn about unfamiliar objects and events;
- appropriately uses and cares for sciencing equipment (magnifiers, scales, etc.);
- quantifies observations (counts, measures, etc.);
- identifies similarities, differences, and changes in materials, events, and phenomena;
- classifies materials, events, and phenomena and explains rationale;
- records data;
- uses sequence of scientific method (prediction, data collection, drawing conclusions, generalization);
- readily shares information with peers and appreciates the perspectives of others; and
- shows familiarity with science processes terminology.

***Goal:* To increase each child's knowledge of the natural world**

***Objectives:***

Each child

- actively participates in a variety of experiences exemplifying the basic science concepts of organization, cause and effect, systems, scale, models, change, structure and function, variations, and diversity;
- experiences activities from a range of science disciplines;
- shows familiarity with terminology related to basic science concepts; and
- represents and communicates knowledge.

*observing:* using senses (seeing, hearing, touching, tasting, smelling) to learn about the characteristics of the environment—in other words, to collect data

*communicating:* naming, recording, and sharing the information with others either orally or in writing

*comparing:* measuring, counting, quantifying, and/or examining objects and events in terms of similarities and differences.

*organizing:* systematically compiling, classifying, and ordering information collected

*relating:* relating concrete and abstract ideas to test or explain a phenomenon; formulating and testing hypotheses

*inferring:* deciding the meaning of the information (data) gathered, including predictions about what may happen, before the result is observed

*applying:* using knowledge and skills to solve problems

Although young children are not methodical, they naturally use one or more of these processes—at least in a superficial way—as they investigate everything that attracts their attention. The early childhood teacher's job is to increase awareness and use of these skills. For 3- and 4-year-olds, it is more appropriate to concentrate on observing, communicating, and comparing, while 7- and 8-year-olds can be expected to begin more systematic data collecting, organizing, and relating. Inferring and applying processes require abstract thinking, and young children are just beginning to become aware of these behaviors.

Young children will also become familiar with science terminology as they hear it being used by adults to describe an activity. Such labeling, however, should not interfere with either the child's enthusiasm for or the use of the sciencing process. Even at the elementary school level, teachers should not require memorization or rigid adherence to scientific terms or procedures; rather, teachers should introduce these as labels and methods to be used appropriately in the investigative process. Children enjoy hearing and using words such as *classifying, hypothesis, experiment,*

***CHILDREN WHO HAVE MANY INTERESTING, DIRECT EXPERIENCES OVER TIME WITH SCIENCE CONCEPTS WILL GRADUALLY UNDERSTAND THE BROADER PRINCIPLES AS THEY DEVELOP THE COGNITIVE SKILLS TO MAKE MORE ABSTRACT GENERALIZATIONS.***

and *observation* and will naturally add these words to their vocabularies as the words become familiar.

For the most part, children learn sciencing processes from their appropriate use as they investigate various phenomena. At times a teacher may plan an activity to focus on a specific process in order to increase children's awareness of it. For instance, activities emphasizing the use of touching, looking, hearing, smelling, or tasting as sources of different kinds of information enhance children's observation skills. Sorting materials into different piles and talking about the reasons for the groupings reveals that there are multiple ways of organizing the same items and that different people may use different criteria.

All children employ their senses in *observing* aspects of their environment. Preschool children tend to focus on the obvious and to be satisfied with identifying one or two characteristics, such as color or texture. School-age children become more systematic, notice more detail, and spontaneously include comparisons, such as harder or softer than.

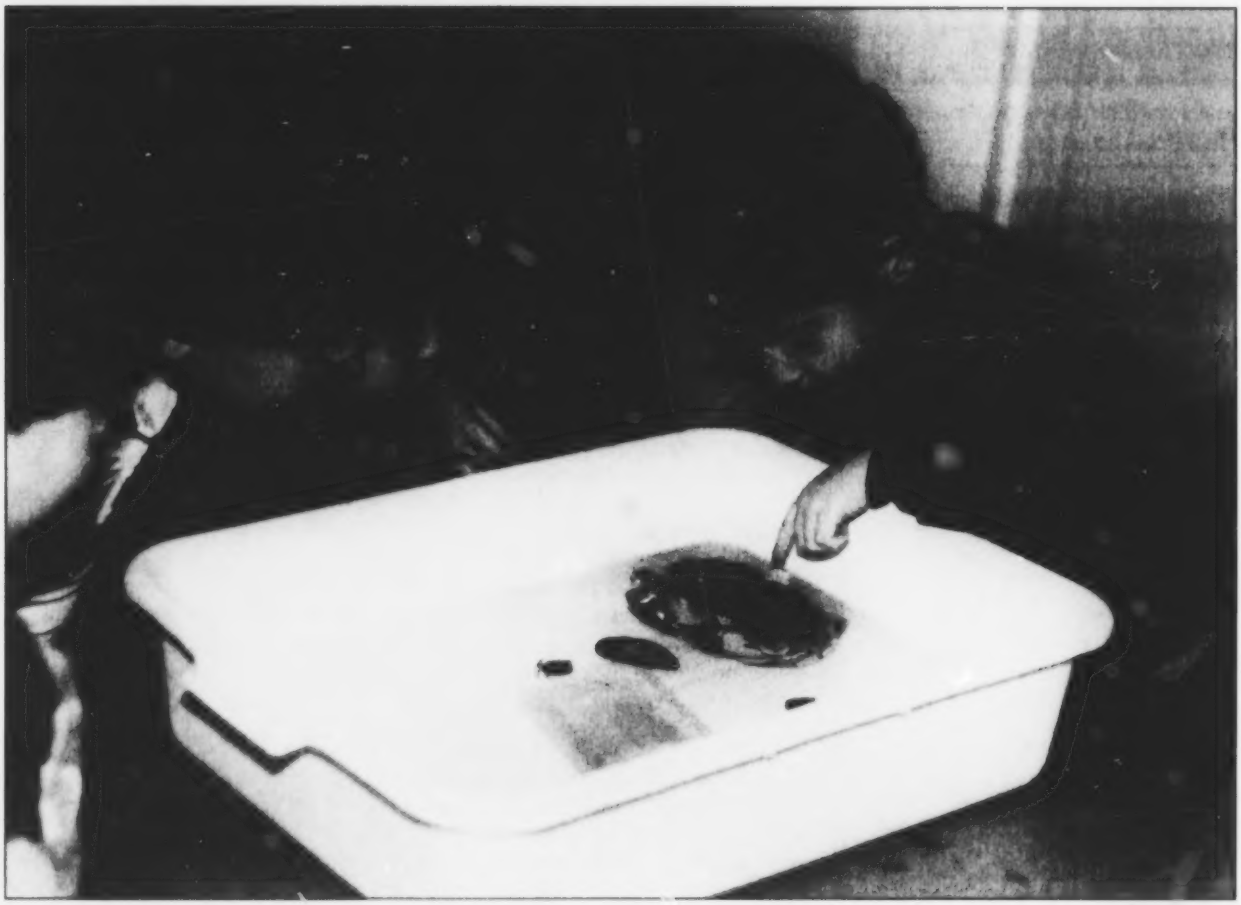
*Communicating* is an essential skill both for keeping records and for sharing knowledge. Communicating includes a willingness to share information with peers and to consider the perspectives of others. Scientific discoveries must be made public to be examined and verified by others. Developmentally, communication reflects a child's ability to understand that something represents the real experience, object, or phenomenon. A representation may be a three-dimensional commercial object, such as a plastic model of the human heart, or a reproduction or enactment, such as a dam that children construct using sand and water; a pictorial, such as a photograph, video, or graph; an oral reproduction; or a written description, including books and other reference materials as sources of information about science phenomena.

Children at 3 or 4 years old are learning to verbally share their observations with peers. They also "talk to themselves," essentially describing to themselves what they are observing as they learn to make connections between the "real thing" and its representation. They sometimes enact their representations physically, such as by crawling on the floor like worms after having observed worms on the playground. Five- and 6-year-olds can be expected to accurately report a short sequence of observations orally and to begin recording some of their data pictorially, on graphs, and in journals and other print. Seven- and 8-year-olds should be very active reporters and recorders. By this age they can follow up on some of their own questions and begin to engage in more systematic record keeping.

*Comparing* and *organizing* refer primarily to mathematical concepts, essentially those included in what Piaget called logico-mathematical knowledge. These processes are vital for science inquiry and involve noticing likenesses and differences, quantifying (measuring, weighing, counting), and organizing objects, materials, or events into groupings on the basis of specific characteristics. Children become increasingly aware of possibilities for comparing and organizing information and will benefit from using these skills. Children can measure objects using any kind of unit: height or length can be measured in the number of crayons long, in the number of hands high, or in comparisons of blocks, beads, or different lengths of adding machine paper. The same principle is true for groupings. The critical aspect is that children begin to organize information by some criteria, not that they memorize typical adult categories. It is also important for children to learn that there are alternative ways of organizing the same information. An array of buttons, for instance, can be grouped according to size, shape, color, number of holes, or presence of a shank (see Chapter 4 for additional suggestions of grouping criteria).

Three- and 4-year-olds are gaining some awareness of these processes and are beginning to use some relational characteristics, such as size, in their descriptions. As was noted earlier, their comparisons reflect obvious surface characteristics, such as color, shape, or number among two or three items, and will generally include only one aspect at a time. Five- and 6-year-olds are aware of more surface characteristics and are more apt to identify both similarities and differences among a small number of items.

Primary-grade children are collectors by nature, and they can impose some organization on large collections, such as dozens of Halloween treats. They may use conventional units and groupings. Children at this age are beginning to understand that objects can be classified in multiple ways and that the objects can be ordered within a grouping, such as longest to shortest, or into hierarchies, for example, dogs as a subset of animals.



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Although younger children may recognize some obvious cause-and-effect relation—for example, "When I put this on the scale, it made the other side go way up"—not until they are 7 or 8 will they begin *relating* and making more methodical investigations of an obvious variable, such as weight.

### *To increase each child's knowledge of the natural world*

Science has evolved into many fields, or content disciplines. Historically, the emphasis has been on learning a specific discipline, such as biology or physics; now the generalizations, relationships, and principles that are applicable to all the sciences are considered more important. These principles, however, are learned through sciencing experiences with specific materials, objects, and instances from various disciplines, not by memorizing the principles.

The National Center for Improving Science Education (1990) identified nine basic concepts around which to focus kindergarten-through-sixth-grade science: *systems, models, constancy and change, scale, organization, cause and effect, structure and function, variations,* and *diversity.* These concepts were selected because they are basic to both science and technology, yet they are also relevant in the personal lives of children and can be experienced by children of different ages.

The Benchmarks for Science Literacy, proposed by the American Association for the Advancement of Science in 1993, reflect these concepts and identify specific goals to be attained by children at different points in their education. The skills and knowledge that the Benchmarks suggest children reach by the end of second grade are summarized in the box on pages 48 to 54. Progress toward these goals is developmental. Many of the basic skills and concepts can be introduced to preschoolers and built upon or expanded as children progress through kindergarten and the primary grades. Children who have many interesting, direct experiences over time with science concepts will gradually understand the broader principles as they develop the cognitive skills to make more abstract generalizations.

## Science Benchmarks to Be Achieved by the End of Grade 2*

***These benchmarks present science knowledge that children should possess, or scientific procedures they should be able to do, by the end of second grade.***

| *CONTENT* | *BENCHMARKS* |
|---|---|
| **1. The nature of science** | By the end of second grade, children should know that |
| **1a.** The scientific world view | • when a science investigation is done the way it was done before, we expect to get a very similar result; and<br>• science investigations generally work the same way in different places. |
| **1b.** Scientific inquiry | • people can often learn about things around them by just observing those things carefully, but sometimes they can learn more by doing something to the things and noting what happens;<br>• tools such as thermometers, magnifiers, rulers, or balances often give more information about things than can be obtained by just observing things without their help;<br>• describing things as accurately as possible is important in science because it enables people to compare their observations with those of others; and<br>• when people give different descriptions of the same thing, it is usually a good idea to make some fresh observations instead of just arguing about who is right. |
| **1c.** The scientific enterprise | • everybody can do science and invent things and ideas;<br>• in doing science, it is often helpful to work with a team and to share findings with others; all team members should reach their own individual conclusions, however, about what the findings mean; and<br>• a lot can be learned about plants and animals by observing them closely, but care must be taken to know the needs of living things and how to provide for them in the classroom. |
| **2. The nature of mathematics** | |
| **2a.** Patterns and relationships | • circles, squares, triangles, and other shapes can be found in things in nature and in things that people build;<br>• patterns can be made by putting different shapes together or taking them apart; and<br>• things move, or can be made to move, along straight, curved circular, back-and-forth, and jagged paths. |
| **2b.** Mathematics, science, and technology | *No second-grade benchmarks* |
| **2c.** Mathematical inquiry | • numbers and shapes can be used to tell about things. |
| **3. The nature of technology** | |
| **3a.** Technology and science | • tools are used to do things better or more easily and to do some things that could not otherwise be done at all; in technology, tools are used to observe, measure, and make things; and<br>• when trying to build something or to get something to work better, it usually helps to follow directions if there are any or to ask someone who has done it before for suggestions. |

* *Excerpted by permission. The full standards provide additional detail.*

| Science Benchmarks (cont'd) | |
|---|---|
| ***CONTENT*** | ***BENCHMARKS*** |
| **3. The nature of technology (cont'd)** | By the end of the second grade, children should know that |
| **3b.** Design and systems | • people can use objects and ways of doing things to solve problems; and<br>• people may not be able to actually make or do everything that they can design. |
| **3c.** Issues in technology | • people, alone or in groups, are always inventing new ways to solve problems and get work done; the tools and ways of doing things that people have invented affect all aspects of life; and<br>• when a group of people wants to build something or try something new, they should try to figure out ahead of time how it might affect other people. |
| **4. The physical setting** | |
| **4a.** The universe | • there are more stars in the sky than anyone can easily count, but they are not scattered evenly, and they are not all the same in brightness or color;<br>• the sun can be seen only in the daytime, but the moon can be seen sometimes at night and sometimes during the day; the sun, moon, and stars all appear to move slowly across the sky; and<br>• the moon looks a little different every day, but looks the same again about every four weeks. |
| **4b.** The earth | • some events in nature have a repeating pattern; the weather changes some from day to day, but things such as temperature and rain (or snow) tend to be high, low, or medium in the same months every year;<br>• water can be a liquid or a solid and can be made to go back and forth from one form to the other; if water is turned into ice and then the ice is allowed to melt, the amount of water is the same as it was before freezing; and<br>• water left in an open container disappears, but water in a closed container does not disappear. |
| **4c.** Processes that shape the earth | • chunks of rocks come in many sizes and shapes, from boulders to grains of sand and even smaller;<br>• change is something that happens to many things; and<br>• animals and plants sometimes cause changes in their surroundings. |
| **4d.** The structure of matter | • objects can be described in terms of the materials they are made of (clay, cloth, paper, etc.) and their physical properties (color, size, shape, weight, texture, flexibility, etc.); and<br>• things can be done to materials to change some of their properties, but not all materials respond the same way to what is done to them. |
| **4e.** Energy transformations | • the sun warms the land, air, and water. |
| **4f.** Motion | • things move in many different ways, such as straight, zigzag, round and round, back and forth, and fast and slow;<br>• the way to change how something is moving is to give it a push or a pull; and<br>• things that make sound vibrate. |
| **4g.** Forces of nature | • things near the earth fall to the ground unless something holds them up; and<br>• magnets can be used to make some things move without being touched. |

| Science Benchmarks (cont'd) | |
|---|---|
| ***Content*** | ***Benchmarks*** |
| **5. The living environment** | By the end of the second grade, children should know that |
| **5a.** Diversity of life | • some animals and plants are alike in the way they look and in the things they do, and others are very different from one another;<br>• plants and animals have features that help them live in different environments; and<br>• stories sometimes give plants and animals attributes they really do not have. |
| **5b.** Heredity | • there is variation among individuals of one kind within a population; and<br>• offspring are very much, but not exactly, like their parents and like one another. |
| **5c.** Cells | • magnifiers help people see things they could not see without them; and<br>• most living things need water, food, and air. |
| **5d.** Interdependence of life | • animals eat plants or other animals for food and may also use plants (or even other animals) for shelter and nesting; and<br>• living things are found almost everywhere in the world; there are somewhat different kinds in different places. |
| **5e.** Flow of matter and energy | • plants and animals both need to take in water, and animals need to take in food; in addition, plants need light; and<br>• many materials can be recycled and used again, sometimes in different forms. |
| **5f.** Evolution of life | • different plants and animals have external features that help them thrive in different kinds of places; and<br>• some kinds of organisms that once lived on earth have completely disappeared, although they were something like others that are alive today. |
| **6. The human organism** | |
| **6a.** Human identity | • people have different external features, such as the size, shape, and color of hair, skin, and eyes, but they are more like one another than like other animals;<br>• people need water, food, air, waste removal, and a particular range of temperatures in their environment, just as other animals do; and<br>• people tend to live in families and communities in which individuals have different roles. |
| **6b.** Human development | • all animals have offspring, usually with two parents involved; people may prevent some animals from producing offspring; and<br>• a human baby grows inside its mother until its birth; even after birth, a human baby is unable to care for itself, and its survival depends on the care it receives from adults. |
| **6c.** Basic functions | • the human body has parts that help it seek, find, and take in food when it feels hunger—eyes and noses for detecting food, legs to get to it, arms to carry it away, and a mouth to eat it;<br>• senses can warn individuals about danger; muscles help them to fight, hide, or get out of danger; and<br>• the brain enables human beings to think and sends messages to other body parts to help them work properly. |

| Science Benchmarks (cont'd) | |
|---|---|
| ***CONTENT*** | ***BENCHMARKS*** |
| **6. The human organism (cont'd)** | By the end of the second grade, children should know that |
| **6d.** Learning | • people use their senses to find out about their surroundings and themselves; different senses give different information; sometimes a person can get different information about the same thing by moving closer to it or farther away from it;<br>• some of the things people do, like playing soccer, reading, and writing, must be deliberately learned; practicing helps people to improve; how well one learns sometimes depends on how one does it and how often and how hard one tries to learn; and<br>• people can learn from each other by telling and listening, showing and watching, and imitating what others do. |
| **6e.** Physical health | • eating a variety of healthful foods and getting enough exercise and rest help people to stay healthy;<br>• some things people take into their bodies from the environment can hurt them;<br>• some diseases are caused by germs, some are not; diseases caused by germs may be spread by people who have them; washing one's hands with soap and water reduces the number of germs that can get into the body or that can be passed on to other people. |
| **6f.** Mental health | • people have many different feelings—sadness, joy, anger, fear, etc.—about events, themselves, and other people;<br>• people react to personal problems in different ways; some ways are more likely to be helpful than others; and<br>• talking to someone (a friend, relative, teacher, or counselor) may help people understand their feelings and problems and what do about them. |
| **7. Human society** | |
| **7a.** Cultural effects on behaviors | • people are alike in many ways and different in many ways;<br>• different families or classrooms have different rules and patterns of behavior; some behaviors are not accepted in most families or schools; and<br>• people often choose to dress, talk, and act like their friends, do the same things they do, and have the same kinds of things they have; they also often choose to do certain things their own way. |
| **7b.** Group behavior | • people belong to some groups by birth and belong to some groups because they join them; and<br>• the way people act is often influenced by the groups to which they belong. |
| **7c.** Social change | • changes happen in everyone's life, sometimes suddenly, more often slowly; people cannot control some changes, but they can usually learn to cope with them. |
| **7d.** Social trade-offs | • getting something one wants may mean giving up something in return;<br>• different people may make different choices for different reasons; and<br>• choices have consequences, some of which are more serious than others. |
| **7e.** Political and economic systems | • money can buy things that people need or want; people earn money by working at a job making or growing things, selling things, or doing things to help other people; and<br>• everyone wants to be treated fairly, and some rules can help to do that. |

| Science Benchmarks (cont'd) | |
|---|---|
| ***Content*** | ***Benchmarks*** |
| **7. Human society (cont'd)** | By the end of the second grade, children should know that |
| **7f.** Social conflict | • disagreements are common, even between family members or friends; some ways of dealing with them work better than others; people who are not involved in an argument may be helpful in solving it; and<br>• rules at home, at school, and in the community let individuals know what to expect and so can reduce the number of disputes. |
| **7g.** Global interdependence | • for many things they need, people rely on others who are not part of the family and maybe not even part of their local community. |
| **8. The designed world** | |
| **8a.** Agriculture | • most food comes from farms either directly as crops or as the animals that eat the crops; to grow well, plants need enough warmth, light, and water; crops also must be protected from weeds and pests that can harm them;<br>• part of a crop may be lost to pests or spoilage;<br>• a crop that is fine when harvested may spoil before it gets to consumers; and<br>• machines improve what people get from crops by helping in planting and harvesting, in keeping food fresh by packaging and cooling, and in moving it long distances from where it is grown to where people live. |
| **8b.** Materials and manufacturing | • some kinds of materials are better than others for making any particular thing; materials that are better in some ways (such as stronger or cheaper) may be worse in other ways (heavier or harder to cut);<br>• several steps are usually involved in making things;<br>• tools are used to help make things, and some things cannot be made at all without tools; each kind of tool has a special purpose; and<br>• some materials can be used over again. |
| **8c.** Energy sources and use | • people can save money by turning off machines when they are not using them; and<br>• people burn fuels such as wood, oil, coal, or natural gas, or use electricity to cook their food and warm their houses. |
| **8d.** Communication | • information can be sent and received in many different ways; some allow answering back and some do not; each way has advantages and disadvantages; and<br>• devices can be used to send and receive messages quickly and clearly. |
| **8e.** Information processing | • there are different ways to store things so they can be easily found later; and<br>• letters and numbers can be used to put things in a useful order. |
| **8f.** Health technology | • vaccinations and other scientific treatments protect people from getting certain diseases, and different kinds of medicines may help those who do become sick to recover. |
| **9. The mathematical world** | |
| **9a.** Numbers | • numbers can be used to count things, place them in order, or name them;<br>• sometimes in sharing or measuring there is a need to use numbers between whole numbers;<br>• it is possible (and often useful) to estimate quantities without knowing them exactly; and<br>• simple graphs can help to tell about observations. |

| Science Benchmarks (cont'd) | |
|---|---|
| ***CONTENT*** | ***BENCHMARKS*** |
| **9. The mathematical world (cont'd)** | By the end of the second grade, children should know that |
| **9b.** Symbolic relationships | • similar patterns may show up in many places in nature and in the things people make; and<br>• sometimes changing one thing causes changes in something else; in some situations, changing the same thing in the same way usually has the same result. |
| **9c.** Shapes | • shapes such as circles, squares, and triangles can be used to describe many things that can be seen. |
| **9d.** Uncertainty | • some things are more likely to happen than others; some events can be predicted well and some cannot; sometimes people aren't sure what will happen because they don't know everything that might be having an effect; and<br>• often a person can find out about a group of things by studying just a few of them. |
| **9e.** Reasoning | • people are more likely to believe your ideas if you can give good reasons for them. |
| **10. Historical perspectives** | *No second-grade benchmarks* |
| **11. Common themes** | |
| **11a.** Systems | • most things are made of parts;<br>• something may not work if some of its parts are missing; and<br>• when parts are put together, they can do things that they couldn't do by themselves. |
| **11b.** Models | • many of the toys children play with are like real things only in some ways; they are not the same size, are missing many details, or are not able to do all of the same things;<br>• a model of something is different from the real thing but can be used to learn something about the real thing; and<br>• one way to describe something is to say how it is like something else. |
| **11c.** Constancy and change | • things change in some ways and stay the same in some ways;<br>• people can keep track of some things, seeing where they come from and where they go;<br>• things can change in different ways, such as in size, weight, color, and movement; some small changes can be detected by taking measurements; and<br>• some changes are so slow or so fast that they are hard to see. |
| **11d.** Scale | • things in nature and things people make have very different sizes, weights, ages, and speeds. |
| **12. Habits of mind** | By the end of the second grade, children should be able to |
| **12a.** Values and attitudes | • raise questions about the world around them and be willing to seek answers to some of them by making careful observations and trying things out. |
| **12b.** Computation and estimation | • use whole numbers and simple, everyday fractions in ordering, counting, identifying, measuring, and describing things and experiences. |

| Science Benchmarks (cont'd) | |
|---|---|
| ***Content*** | ***Benchmarks*** |
| **12. Habits of mind (cont'd)** | By the end of the second grade, children should be able to |
| **12b.** Computation and estimation (cont'd) | • readily give the sums and differences of single-digit numbers in familiar contexts where the operation makes sense to them and they can judge the reasonableness of the answer;<br>• give rough estimates of numerical answers to problems before doing them formally;<br>• explain to other students how they go about solving numerical problems; and<br>• make quantitative estimates of familiar lengths, weights, and time intervals and check them by measurements. |
| **12c.** Manipulation and observation | • use hammers, screwdrivers, clamps, rulers, scissors, and hand lenses, and operate ordinary audio equipment;<br>• assemble, describe, take apart and reassemble constructions using interlocking blocks, erector sets, and the like;<br>• make something out of paper, cardboard, wood, plastic, metal, or existing objects that can actually be used to perform a task; and<br>• determine the linear dimensions in whole units of objects having straight edges. |
| **12d.** Communication skills | • describe and compare things in terms of number, shape, texture, size, weight, color, and motion; and<br>• draw pictures that correctly portray at least some features of the thing being described. |
| **12e.** Critical-response skills | • ask "How do you know?" in appropriate situations and attempt reasonable answers when others ask them the same question. |

How does one organize a coherent science curriculum for young children that progresses toward this very long list of outcomes? One approach is to focus on the processes discussed earlier and on the underlying content concepts. Table 2 illustrates how developmentally appropriate activities for children of different ages could be provided for each of the 9 basic concepts (NCISE 1990). Following the definition of each concept are specific Benchmarks that the sample activities could address.

The sample activities include a range of content focusing on life, earth, and physical sciences. For economy, we have identified the essence of each activity and the type of focusing questions that could be used. In reality, however, implementation of these activities in a classroom would follow the criteria for developmentally appropriate sciencing suggested in the following section on learning environments. These strategies include working with individual children or with small groups of four to five children and providing time for them to investigate the materials on their own before the adult raises questions and extends the activity.

Over the course of a school year, sciencing experiences should include a range of the basic science concepts and a variety of content from life, earth, and the physical sciences. Equally important as sampling the range of science concepts and content are opportunities for pursuing some topics in depth, continuing beyond awareness so that children can gain more knowledge and skills. Often classrooms have a theme each day or each week, with little or no chance for children to repeat sciencing experiences or to extend them over a longer time period. Young children need many opportunities to investigate the same content or to use the same methods with various content in order to gain a sense of understanding or mastery of either concept or process.

To enable children to develop more elaborated or complex understandings of science as they get older,

teachers can either engage children in more extensive investigation of the same content at higher age levels, or they can introduce different instances of a concept over time, as illustrated in Table 2. An example of the former would be when making jello to explore change, 3-year-olds spend more time tasting, smelling, stirring, and checking on the solidifying process than older do children, who are more concerned with figuring out why the jello "hardened." The younger children, however, are able to generate some hypotheses about what will happen to the jello as it cools and may be able to tell their parents about what happened, as well as identify the sequence of steps they followed in making the jello. Seven- and 8-year-olds can conduct an experiment by putting different containers of jello in cooler and warmer locations and recording the amount of time each took to solidify. They can also prepare a report of their findings, complete with a graph showing the number of minutes or hours it took the liquid to become solid in each location. They might even experiment with changing the solid back into a liquid. As children engage in various activities and opportunities occur, adults should encourage them to consider the concepts, even though children may not understand the meaning of the concepts. For example, asking "How did the jello change from when we started to make it to now that it's ready to eat?" increases awareness of the different states of matter.

The specific instances of the concepts also will vary with the locale and with the experiences of the children in the group. The specific objects, materials, and phenomena used with young children should be familiar to them or easily linked to something they know in their own homes, neighborhoods, and classrooms. Making ice cream is a good example of change because most children are familiar with the end product, but many are not aware that ice cream is a liquid prior to freezing. Studying seashells or sea life may be an appropriate activity to provide examples of variation for children living (or vacationing) near oceans, whereas studying stones is more appropriate for children familiar with mountains or deserts.

Although the notion of familiarity may sound uninteresting to adults, young children are fascinated with things they know and can do. Familiarity is not as restrictive as it sounds. Many of the things children do have possibilities for sciencing—exploring the combination of colors while painting or coloring; riding tricycles or bicycles with and without passengers; collecting leaves; digging holes with spoons rather than shovels; or observing the viscosity of syrup, oil, and water during cooking (several excellent sources of sciencing activities are included with the references at the end of this chapter). Emphasis on the familiar does not mean that new concepts or different perspectives are not introduced to young children, rather that the unfamiliar should begin with a connection to the child's current knowledge or experiences. An oscilloscope, for instance, could be introduced as part of the study of vibrations (an example of cause and effect) after beginning with familiar experiences, such as examining whistles, feeling one's own vocal chords while talking, or playing with sounds made by tapping glasses that have different water levels.

***SPONTANEOUS SCIENCING OCCURS WHENEVER A CHILD OR TEACHER SEES SOMETHING OF INTEREST AND WONDERS ABOUT IT.***

The overriding consideration in planning for sciencing is that the child be actively involved. DeVries and Kohlberg (1987) define active involvement as the child's control of the sciencing process, not just handling of the materials or objects. The child must be able to produce the phenomenon by her own actions and be able to vary this action to effect change in the phenomenon. Two additional criteria suggested by DeVries and Kohlberg to facilitate the young child's understanding of sciencing phenomena are that the results of the child's action be immediate and observable by the child. There are phenomena, such as planting seeds, in which the results are not immediate but the basic principle is still applicable—fast-germinating seeds, such as grass or beans, should be used rather than pumpkins or other slower growing seeds. The longer the interval between the children's action and the results, the more assistance children will need to remember the initial action. Pictures and written records can help, but young children gain little from experiences in which the interval from beginning to end is so long or so complex that they lose interest, forget the initial steps, or confuse the activity with other activities.

The description of science so far implies that all sciencing is carefully planned. However, there are many spontaneous sciencing opportunities that are very important in the curriculum. Spontaneous sciencing occurs whenever a child (or a teacher) sees something of interest and wonders about it—how worms move without legs, why the drinking fountain squirts up, why cuts bleed, why rocks are different, or how to get a bucket of water to the top of the jungle gym. Most learning about science for very young

| *Table 2.* DEVELOPMENTALLY APPROPRIATE | | |
|---|---|---|
| *BASIC CONCEPT*[1] | *EXPLORATION/INQUIRY—3- TO 4-YEAR-OLDS* | |
| **Systems**<br>Systems are collections of things (objects, organisms, machines, processes, ideas, etc.) that have some influence on one another and seem to constitute a unified whole.<br>*Design and systems (3b)*[2]*; Systems (11a)* | *Human body*<br>Feel heartbeat, listen with stethoscope, and look at veins.<br>*Focusing questions*[3]: How does your heart sound? What does it feel like? Why do people have hearts? What else has a heart? | |
| **Models**<br>Models are representations of the "real" object or phenomenon designed to help in understanding the real thing. Models can be conceptual (word descriptions of drawings), mathematical (equations or other formal representations), or physical (real objects with some of the characteristics of the real thing).<br>*Scientific inquiry (1b); Models (11b)* | *Housekeeping replicas*<br>Compare dollhouse or housekeeping furniture/dishes with full-size furniture dishes of same design.<br>*Focusing questions:* How are they similar/different? Why do we have smaller models? | |
| **Constancy and change**<br>Everything is continually changing.<br>*The scientific enterprise (1c); Constancy and change (11c)* | *Baby pictures*<br>Each child bring pictures of self as a baby.<br>*Focusing questions:* How are you the same? How have you changed? | |
| **Scale**<br>Scale refers to a quantity such as speed, size, distance of an object, system, component, etc., either in absolute terms or in comparison to another.<br>*Scale (11d); Scientific inquiry (1b)* | *Stone hunt*<br>Children find larger (smaller) stones than one identified.<br>*Focusing questions:* Which are larger/smaller? How can you tell? | |
| **Organization/orderliness (patterns and relationships)**<br>To make the vast amount of information about the world understandable, people (scientists) have organized it in different ways. The most common organizations are hierarchies, simple-to-complex arrays, and symmetry.<br>*Processes that shape the earth (4c); Structure of matter (4d)* | *Properties of materials*<br>Gather 4–5 different materials, such as balls of clay, play-dough, pieces of wood, foil, elastic, paper, Styrofoam.<br>*Focusing questions:* What happens when you bend/tear/twist? Which are softer/smoother? | |

[1] *Basic concepts and their descriptions were derived from American Association for the Advancement of Science,* Science for All Americans, *1989, and National Center for Improving Science Education,* Getting Started in Science. A Blueprint for Elementary School Science Education, *1990.*

[2] *Numbers refer to examples of the specific benchmarks for scientific literacy (identified on pp. 48–54) that this content addresses.*

[3] *Focusing questions could be used* after *children have explored materials independently rather than to direct children's initial explorations.*

| Examples of Basic Science Concepts | |
|---|---|
| ***Exploration/Inquiry—5- to 6-year-olds*** | ***Exploration/Inquiry—7- to 8-year-olds*** |
| *Human body*<br>Draw heart, arteries, veins in life-size body tracing after listening to heart and engaging in discussion.<br>*Focusing questions:* How does the heart work? How does blood travel? What happens if heart does not work well? | *Human body*<br>Add lungs to discussion, and do body tracing (see entry for 5- to 6-year olds).<br>*Focusing questions:* What do your lungs do? How do they work? What happens if lungs do not function well? |
| *Model toy comparison*<br>Compare a model toy vehicle with identical "real" vehicle.<br>*Focusing questions:* How are they similar/different? Why do we have smaller models? | *Architect visit*<br>Have an architect visit with a drawing and scale model of a house or other easily recognized building.<br>*Focusing questions:* What is similar/different about the drawing and the model? Which is front/back? Why do we have models? |
| *Making butter*<br>Children shake whipping cream in a jar until it turns into butter. Sample on crackers.<br>*Focusing questions:* What was the cream like when we started? What was it like when we finished? Why/how did it change? | *Rusting*<br>Each child selects objects from an array (buttons, paper clips, nails, etc.) to place into a jar lid filled with water, adds water daily, and records in science journal which items rust.<br>*Focusing questions:* Tell me about rusting. How can you make something rust? How can you keep something from rusting? |
| *Which is longer?*<br>Children decide which of 2–3 straws of similar length is longer visually.<br>*Focusing questions:* How could you know which is longer? What are different ways of measuring? | *Drawing*<br>Fold a piece of paper into eighths. Draw a picture. Open paper and draw same picture on half of paper.<br>*Focusing questions:* What is the same/different about the two drawings? When/how might someone use different sizes? |
| *Different ways of organizing information*<br>Children group and regroup themselves according to characteristics (permanent and temporary), such as eye or hair color, handedness, shirt/blouse color, shoes.<br>*Focusing questions:* How are groups alike/different? What are other possible groupings? | *Patterns in nature*<br>Compare crayon rubbings of different leaves gathered on a walk. Then compare with other children and record names of each child with similar leaf pattern on back of appropriate rubbing.<br>*Focusing questions:* How are the rubbings alike/different? What patterns can you see or make? |

| *Table 2.* (CONT'D) | | |
|---|---|---|
| *BASIC CONCEPT* | *EXPLORATION/INQUIRY—3- TO 4-YEAR-OLDS* | |
| **Cause and effect**<br>Nature behaves in ways that are predictable. The primary purpose of science is to try to identify the basic causes and explanations for phenomena.<br>*Scientific inquiry (1b); Reasoning (9b)* | *Inclines*<br>Combine blocks and incline boards with toy cars.<br>*Focusing questions:* How can you make a car go faster/slower? | |
| **Structure and function**<br>There is a relationship between the way organisms look/feel/smell/sound/taste and the actions they perform.<br>*Diversity of life (5a); Basic functions (6c)* | *Movement*<br>Children move in different ways from the ways familiar animals, birds, and reptiles move.<br>*Focusing questions:* Show me how _____ move. What can you think of that moves a different way? | |
| **Discontinuous and continuous properties (variations)**<br>All organisms and objects have distinctive properties. Most of these properties are variations along a continuum, for some (such as living or nonliving) are not.<br>*Learning (6d); The scientific world view (1a)* | *Exploring sounds*<br>Investigate the sounds of 3–4 plastic milk containers filled with different amounts of water by tapping with a Popsicle stick.<br>*Focusing questions:* How does it sound? How can the sound be changed? | |
| **Diversity**<br>There are many different types of objects and organisms in the natural world.<br>*Diversity of life (5a); Evolution of life (5f)* | *Seeds*<br>Compare seeds from 3–4 different familiar plants, such as popcorn, peas, and pumpkins.<br>*Focusing questions:* How are they alike/different? What would happen if we planted them? | |

children probably results from such spontaneous observations, which can provide an experiential basis for additional sciencing activities.

## Facilitating sciencing

Although sciencing can occur spontaneously, what children gain can be enhanced and increased by planning. Both the classroom environment and our teaching strategies should encourage active sciencing.

### *The physical environment*

One of the nice things about sciencing is that it can occur anywhere at any time, although many classrooms also have a science center. The advantage of having a science center is that it is a constant reminder that science is an integral curriculum area. However, there also are some potential problems with the science center approach. One is that teachers begin to think that sciencing occurs only in the center and fail to take advantage of the many opportunities throughout the classroom and outdoors. Another problem is that science centers often become very uninteresting places, containing little more than a bird's nest and a few dead leaves with a magnifying glass. Sciencing centers should be safe, attractive areas with frequently changing activities that invite children to investigate and to extend their observations using tools and representations. At a minimum, every classroom should include something living (plants, fish, animals) that the children can observe and care for over a period of time. Science centers are sometimes linked to a curriculum unit, such as various gourds to examine and sort, with pictures or books for identification, before or after a field trip to a farm. Other times the science area may focus on a separate topic, such as nuts in the

| *Exploration/Inquiry—5- to 6-year-olds* | *Exploration/Inquiry—7- to 8-year-olds* |
|---|---|
| *Shadows*<br>Create shadows with flashlights.<br>*Focusing questions:* How can you make a shadow? How can you make it larger/smaller? Identify objects from shadows. | *Inclines*<br>Gather blocks, boards, and toy vehicles. Record on masking tape the number of blocks used, and mark with the tape where the vehicle stops.<br>*Focusing questions:* How did you make the vehicle go faster/slower? How many blocks did you use? |
| *Eating utensils*<br>Examine a table knife, fork, and spoon.<br>*Focusing questions:* How are they alike/different? How are they used? How does their design help their function? | *Design and use of front feet/limbs*<br>Investigate the relation between the front feet/limbs of familiar animals, such as cats, squirrels, and cows and describe their function.<br>*Focusing questions:* How are they alike/different? How are they used? How does their design help them function? |
| *Sounds of a musical instrument*<br>Investigate the different sounds a single musical instrument makes.<br>*Focusing questions:* How does it sound? How can the sound be changed? How can different people make the same sounds? | *Compare sounds of different musical instruments*<br>Compare the same notes on 2–3 different instruments after listening to a range of sounds for each instrument separately.<br>*Focusing questions:* How are the sounds alike/different? How can the sounds be changed? |
| *Different leaves*<br>Collect as many different leaves as possible on a walk around the block.<br>*Focusing questions:* How are the leaves different/alike? Why do you think they are alike/different? | *Living organisms*<br>How many living organisms can the class list? How many organisms can you list that no longer live?<br>*Focusing questions:* Which organisms live on land/in the water? Why do you think some organisms are extinct? |

shell or seashells, with clay to make impressions for study, or an investigation of machines, with the class developing a list by checking machines used at home and on the playground and taking apart a discarded toaster using other tools in the science center.

### *The teacher*

In addition to planning and preparing activities, teachers are role models and facilitators of sciencing. As we know from our own past experiences, and as the National Research Council teaching standards remind us,

- what people learn is greatly influenced by how they are taught;
- knowledge is actively constructed by a student through a process that is individual and social; and
- teachers are continuous learners, inquiring into the understanding of science, their students, and their teaching practice. (1994, 11-2, 11-3)

As models, teachers should display all of the behaviors identified as outcomes for the children. Teachers who think that holding worms or mice or observing spiders is distasteful must work to overcome such aversions or to incorporate the content with different examples, such as caterpillars, gerbils, and ants. Teachers are not expected to know all there is to know about sciencing. What is important is that the teacher be open, enthusiastic, and willing to wonder "What happens if . . . ?"

Within a well-organized but informal sciencing environment, there are a variety of techniques for facilitating and extending children's thinking. Creating an atmosphere that implies that each child brings a different but equally important perspective, that supports inquiry and experimentation, and that accepts "mistakes" is vital for sciencing. New discoveries often result from "things going wrong" or when a subject is approached from a different perspective.

Creating such an atmosphere can be accomplished by showing respect for each child, by sitting beside her, and by listening to and talking with individuals about what they are doing from their perspective; for example, by observing, "You have really tried many ways to figure that out, haven't you?" rather than passing judgments about right or wrong.

An effective technique for increasing children's awareness and use of different approaches is for the adult to join the children in their activity and to begin by imitating what a child is doing (Forman & Hill 1984). The adult then gradually moves beyond what the child is doing. If, for instance, the focus is on bubbles, after the child has had time to explore blowing bubbles in various ways but has not spontaneously used some of the different bubble-makers provided, the teacher sits beside the child. After using the same bubble-maker as the child is using, the teacher begins to try different ones. It is frequently not necessary to call a child's attention to the teacher's behavior for the child to notice it and to expand his exploration.

Comments or questions can be posed at strategic times during a child's sciencing. These questions often are just the articulation of the unspoken ones that the child appears to be addressing through her behavior. The best questions are open-ended, encouraging the child to put into words what she is seeing, doing, and thinking.

The four-step learning and teaching cycle proposed by Bredekamp and Rosegrant (1992; this volume, pp. 19–21) provides a useful framework for sciencing. The appropriate comment or question varies with the step at which the child is operating in the learning cycle—awareness, exploration, inquiry (experimentation), or utilization (representation). Types of questions to extend children's thinking during each phase of the learning cycle are shown in Table 3.

During the child's initial exploration of a phenomenon, adults should ask questions judiciously. Exploration can be thwarted if an adult intrudes too early with questions that the child may interpret as suggesting a specific approach or answer. The teacher's primary role during this time is to provide examples or instances of the phenomenon and a variety of tools for investigating it and then to observe the child's natural investigation. The teacher should intercede only to facilitate the child's exploration of the phenomenon. Appropriate comments during this phase can be very general, for example, "That's an interesting way to look at a toaster, isn't it?" as the child turns an old toaster upside down while taking it apart. Such interaction should stimulate the child to do something rather than to respond with the correct answer.

***DURING THE CHILD'S INITIAL EXPLORATION OF A PHENOMENON, ADULTS SHOULD ASK QUESTIONS JUDICIOUSLY, NOT INTRUDING WITH QUESTIONS THAT THE CHILD MAY INTERPRET AS SUGGESTING A SPECIFIC APPROACH.***

Questions that direct attention to the characteristics of an object or phenomenon, its description, quantification, classification, or relation to other objects or phenomena are appropriate later in the exploration phase. These are mainly "how" questions, involving description and comparisons: "How does it look/feel/smell/sound?" "How are they alike/different?" The emphasis at this time is on the child's description and organization of information, not on a correct answer. Some naming ("What is it called?" "What are other things like this called?") may be appropriate, but children often can give an accurate label without understanding the meaning.

Appropriate questions during the inquiry/experimentation phase are those related to controlling or making something happen and understanding the characteristics or boundaries of the phenomenon. This process goes beyond the organization of information that is characteristic of the exploration phase. It is a more systematic exploration. The child is more deliberate in trying various things as though testing hypotheses. Extending questions are primarily "How?" "When?" "Why?" "What happens if . . . ?" "How can you do/make/create . . . ?" "How do you know . . . ?" "How/When/Why does it happen?"

Because young children are just beginning to understand that symbols represent the real object or phenomenon, representation (other than verbal reports or primitive drawings) usually must be instigated by adults. Rather than asking questions to stimulate the child's discovery, as in the previous phases, the teacher at this time should help the child understand the link between the phenomenon and the representation. Therefore, the teacher may need to select the medium for representing the phenomenon and help the child recognize each step in the process from the "real" to the representation. Sometimes the materials provided suggest the representation, such as pictures of the activity or a flannel board with shapes representing the aspects or sequences of the activity. At other times the adult may have to ask, "What can you do to remember what you did?" or "How can you show other people what happened?"

*Table 3.* QUESTIONS/COMMENTS TO ENCOURAGE SCIENCING BY YOUNG CHILDREN

| *LEARNING CYCLE* | *SCIENCING PROCESSES* | *APPROPRIATE TYPES OF FOCUSING QUESTIONS* [*EACH SUBSEQUENT STEP IN THE SEQUENCE ALSO INCLUDES USE OF THE STRATEGIES AND RELATED FOCUSING QUESTIONS OF THE PREVIOUS STEP(S)*] |
|---|---|---|
| *Awareness* | Observing | Have you seen _____?<br>Have you had a chance to try _____? |
| *Exploration* | Observing | Describing child's activity<br>How does it feel/look/smell/sound/taste (if safe)? |
| | Comparing | How are they alike/different? Which things go together? |
| | Quantifying | How many? How long? |
| | Organizing | How could you group them? |
| *Inquiry/experimentation* | Classifying | Which things go together? |
| | Relating | What can you do to make it happen?<br>What happens when/if you do _____?<br>When does it happen? |
| | Inferring | What else can you think of that works like/does this?<br>Why do you think it happens?<br>How do your observations compare with other children's? |
| *Utilization* | Applying | How could you use what you learned?<br>How could it help people? |
| | Communicating (representing) | How can you show/remember/share with others what you did/learned?<br>What other questions/ideas did you think of? |

## Assessing sciencing attitudes, skills, and knowledge

Consistent with the goals for sciencing, evaluations of children's attitudes, skills, and knowledge should focus on the process, be based on multiple sources of information, and be ongoing. Assessment of preschool children will be primarily teacher observations and discussions with the children as they are sciencing. Children's responses to the focusing questions discussed earlier reveal their thinking about sciencing. To use this information for assessment, teachers should be relatively consistent in their conversations with the children and systematically record these observations of each child at regular intervals three to four times throughout the school year. By keeping notes of the activities and discussions with a couple of children each day, teachers can collect data fairly easily. At a minimum, teachers should keep records of which children participate and their level of interest in sciencing experiences. If comparable information is needed, the teacher could observe and interview individual children with a standard set of questions as they investigate a "new" activity that elicits specific processes or concepts.

Samples of journals, drawings, or reports by school-age children also provide information about knowledge, skills, and progress during the year. Other valuable but less formal indicators of children's interest and knowledge of sciencing are how they approach and solve other problems, the types of activities they select when they have a choice, the books they take out of the library, and parents' reports of what children do and talk about at home. Teachers can use writ-

ten tests to assess elementary children, but these tests should be used sparingly and must closely reflect the specific sciencing experiences of the children.

## Overview of developmentally appropriate sciencing

In summary, developmentally appropriate sciencing builds on children's curiosity and willingness to explore the things around them. It entails investigating phenomena facilitated by open-ended questioning that encourages children to organize information and to reach their own conclusions (see Table 4). Developmentally inappropriate sciencing is teacher dominated, focused on the right answers and memorization.

For the children of today to become responsible custodians of our planet in the future, they must be prepared with an open attitude and the skills to observe and organize information, to generate and test hypotheses, and to question, evaluate, and revise conclusions.Sciencing during early childhood can contribute a strong foundation for a scientifically literate population.

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*Table 4.* FOR CHILDREN 3 THROUGH 8, DEVELOPMENTALLY APPROPRIATE SCIENCING . . .

| *Is* | *Is Not* |
|---|---|
| Actively participating<br>Handling materials<br>Controlling their own actions | Memorizing a lot of facts<br>Watching the teacher do most of the demonstrating and handling of objects |
| Investigating familiar phenomena | Studying content with no link to their knowledge or experience |
| Reflecting on teachers' open-ended questions | Being restricted by closed, single-right-answer questioning or being told what to expect |
| Observing the results of their own actions | Lacking opportunities to observe the results of their own actions |
| Experiencing both planned and spontaneous opportunities | Experiencing science only as teacher-planned activities |
| Investigating and working individually or in small groups | Participating in science activities only in a large group |
| Investigating the range of basic concepts | Learning about only one or two concepts |
| Exploring a variety of content from life, earth, and physical sciences | Learning only limited content |
| Having their knowledge and skills assessed in multiple ways | Having their knowledge and skills assessed only by written tests |

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# 6

# Transforming Health Curriculum

*Charlotte Hendricks and Connie Jo Smith*

Most people value their health and the health of their family; however, many do not know how to achieve or maintain good health. Others have conflicting beliefs, attitudes, or habits that make optimum health difficult to achieve. One way to have a more healthful population is to encourage development of health-promoting habits during early childhood. Early education about health can begin a lifelong process of learning about ourselves and our relationships to others and the world around us. Children's experiences with their health and ways to improve it enhance their desire and ability to make wise decisions in the future (Hendricks & Smith 1991).

Effective health education promotes lifelong responsibility. *National Health Education Standards*—developed by the Joint Committee on National Health Education Standards (1995) with representatives from the Association for the Advancement of Health Education, the American School Health Association, and the American Public Health Association—are now available to guide health education in K–12 educational institutions. The overall goal of the standards is "health literacy," which is defined as "the capacity of individuals to obtain, interpret, and understand basic health information and services, and the competence to use such information and services in ways which enhance health . . . . The health literate person is: a critical thinker and problem solver; a responsible, productive citizen; a self-directed learner; and an effective communicator" (Joint Committee on National Health Education Standards 1995, 5). For young children from birth through age 8, health literacy is promoted through experience and learning activities related to personal health.

The National Health Education Standards consist of seven desired outcomes for health education programs designed to produce health literacy across the K–12 age span. The document also articulates performance indicators for children in kindergarten through Grade 4 for each of the seven standards (see pp. 66–68 for a complete list of health education standards and performance indicators for Grades K–4). These standards provide a set of goals and a framework for ensuring the intellectual integrity of health content and determining what content is of most worth according to the experts in the discipline, as recommended in NAEYC's Curriculum Guidelines 11 and 12 (see p. 16). Unlike some disciplines' standards, the health standards do not provide conceptual organizers or themes within the various standards to enable children to construct meaningful understandings. To help individual teachers and curriculum planners with this task, we have suggested health topics related to each performance indicator (see the second column of the Standards box on pp. 66–68). Further, the health standards do not describe a developmental continuum to help teachers and curriculum planners determine what health content is accessible and appropriate as children move from kindergarten through Grade 4. As for the relevance of

| Health Education Standards—Grades K through 4* | |
|---|---|
| ***Standard*** | ***Related Health Topics*** ***(suggested by the authors)*** |
| **1. Comprehend concepts related to health promotion and disease prevention.** | |
| Children will | |
| **a.** describe relationships between personal health behaviors and individual well-being; | Personal health; nutrition; disease prevention and control; injury prevention and safety; substance use and abuse |
| **b.** identify indicators of mental, emotional, social, and physical health during childhood; | Personal health; emotional and mental health; nutrition |
| **c.** describe the basic structure and functions of the human body systems; | Personal health; nutrition |
| **d.** describe how the family influences personal health; | Family life |
| **e.** describe how physical, social, and emotional environments influence personal health; | Personal health; emotional and mental health; family life; disease prevention and control; community health; substance use and abuse; environmental health |
| **f.** identify common health problems of children; | Personal health; emotional and mental health; nutrition; disease prevention and control;injury prevention and safety |
| **g.** identify health problems that should be detected and treated early; and | Personal health; emotional and mental health; nutrition; disease prevention and control |
| **h.** explain how childhood injuries and illnesses can be prevented or treated. | Nutrition; disease prevention and control; injury prevention and safety |
| **2. Demonstrate the ability to access valid health information and health-promoting products and services.** | |
| Children will | |
| **a.** identify characteristics of valid health information and health-promoting products and services; | Consumer health |
| **b.** demonstrate the ability to locate resources from home, school, and community that provide valid health information; | Community health; consumer health |
| **c.** explain how media influences the selection of health information, products, and services; and | Consumer health |
| **d.** demonstrate the ability to locate school and community health helpers. | Community health |
| **3. Demonstrate the ability to practice health-enhancing behaviors and reduce health risks.**** | |
| Children will | |
| **a.** identify responsible health behaviors; | Personal health; nutrition; disease prevention and control; injury prevention and safety; substance use and abuse; environmental health |
| **b.** identify personal health needs; | Personal health; nutrition |

** Excerpted with permission. The full standards provide additional detail.*
*** These standards are most applicable for preschool health education.*

| Health Education Standards (cont'd) | |
|---|---|
| ***Standard*** | ***Related Health Topics*** *(suggested by the authors)* |
| **Standard 3 (cont'd)** | |
| c. compare behaviors that are safe to those that are risky or harmful; | Disease prevention and control; injury prevention and safety; substance use and abuse |
| d. demonstrate strategies to improve or maintain personal health; | Personal health; nutrition; disease prevention and control; injury prevention and safety; substance use and abuse |
| e. develop injury prevention and management strategies for personal health; | Injury prevention and safety |
| f. demonstrate ways to avoid and reduce threatening situations; and | Personal health; injury prevention and safety; substance use and abuse |
| g. apply skills to manage stress. | Emotional and mental health; family life; substance use and abuse |
| **4. Analyze the influence of culture, media, technology, and other factors on health.** | |
| Children will | |
| a. describe how culture influences personal health behaviors; | Personal health; emotional and mental health; family life; substance use and abuse; nutrition |
| b. explain how the media influence thoughts, feelings, and health behaviors; | Consumer health |
| c. describe ways in which technology can influence personal health; and | Personal health; disease prevention and control; community health; consumer health; environmental health |
| d. explain how information from school and family influences health. | Personal health; family life; community health; substance use and abuse; nutrition |
| **5. Demonstrate the ability to use interpersonal communication skills to enhance health.** | |
| Children will | |
| a. distinguish between verbal and nonverbal communication; | Emotional and mental health; family life |
| b. describe characteristics needed to be a responsible friend and family member; | Emotional and mental health; family life |
| c. demonstrate healthy ways to express needs, wants, and feelings; | Personal health; emotional and mental health; family life |
| d. demonstrate ways to communicate care, consideration, and respect of self and others; | Personal health; emotional and mental health; family life; environmental health |
| e. demonstrate attentive listening skills to build and maintain healthy relationships; | Emotional and mental health; family life |
| f. demonstrate refusal skills to enhance health; | Emotional and mental health; injury prevention and safety; substance use and abuse |
| g. differentiate between negative and positive behaviors used in conflict situations; and | Emotional and mental health; family life; injury prevention and safety; substance use and abuse |
| h. demonstrate nonviolent strategies to resolve conflicts. | Emotional and mental health; family life; injury prevention and safety; substance use and abuse |

| Health Education Standards (cont'd) | |
|---|---|
| ***Standard*** | ***Related Health Topics*** ***(suggested by the authors)*** |
| **6. Demonstrate the ability to use goal-setting and decision-making skills to enhance health.** Children will | |
| **a.** demonstrate the ability to apply a decision-making process to health issues and problems; | Personal health; disease prevention and control; injury prevention and safety; community health; substance use and abuse; consumer health; nutrition |
| **b.** explain when to ask for assistance in making health-related decisions and setting health goals; | Personal health; community health; consumer health |
| **c.** predict outcomes of positive health decisions; and | Personal health; emotional and mental health; nutrition; disease prevention and control; injury prevention and safety; substance use and abuse |
| **d.** set a personal health goal and track progress toward its achievement. | Personal health; emotional and mental health; substance use and abuse; nutrition |
| **7. Demonstrate the ability to advocate for personal, family, and community health.** Children will | |
| **a.** describe a variety of methods to convey accurate health information and ideas; | Community health; consumer health |
| **b.** express information and opinions about health issues; | Personal health; emotional and mental health; family life; community health; substance use and abuse; consumer health; environmental health |
| **c.** identify community agencies that advocate for healthy individuals, families, and communities; and | Disease prevention and control; injury prevention and safety; community health; consumer health; environmental health |
| **d.** demonstrate the ability to influence and support others in making positive health choices. | Family life; disease prevention and control; injury prevention and safety; community health; substance use and abuse; consumer health; environmental health |

health education for preschoolers, the national standards are silent. This chapter addresses each of these aspects of an early childhood curriculum framework. The purpose of this chapter is twofold: to suggest meaningful conceptual organizers or themes and to describe the developmental continuum of children's learning, beginning with the preschool years.

## A comprehensive health education program

Effective health education cannot be accomplished by telling children about health and illness; rather, it requires that children understand the concepts and develop the intellectual tools needed to build and maintain a healthful lifestyle (Pollock & Middleton 1989). Early childhood teachers should determine what children at various ages need to know and be able to do, building a foundation based on natural curiosity, and then use appropriate teaching methods that make learning about promoting health and achieving healthy outcomes enjoyable and engaging.

Comprehensive health education is more effective in promoting healthy lifestyle behavior than are single-focus curriculums such as nutrition education or safety education. Comprehensive health education is sequential; some topics are emphasized every year, while others are not. Teachers address ideas and concepts that children can grasp at their developmental level and then progressively build on what children already know and understand.

Most early childhood educators have little or no background in health education; likewise, most health educators have little background in childhood education, particularly for the years before school. A good health educator may develop a curriculum or program with inappropriate learning activities, or a good teacher may use excellent learning strategies but convey inaccurate health concepts. Collaboration between these two fields is essential to create an effective health education program that promotes personal health. To be most effective, professionals in both fields must learn from each other. Health educators can help early childhood teachers become familiar with the content of comprehensive health education and the supporting concepts and information. Early childhood educators can then apply their knowledge of child development and learning theory in developing curriculum and selecting developmentally appropriate teaching strategies that motivate and enable children to learn. Two examples of such collaboration are the comprehensive health curricula *Here We Go, Watch Me Grow!* (Hendricks & Smith 1991) and *I Am Amazing!* (Breighner & Rohe 1990).

The effective teacher assesses individual children or groups of children and determines where they are on a developmental continuum of health knowledge. Some children obtain early health education and develop health behaviors primarily in the home as they observe adult behaviors. These children arrive at school already demonstrating the expected levels of awareness and, perhaps, utilization of health knowledge; but other children are unaware of even basic health concepts. Health education, like all good education, must be individualized.

Assessment can be appropriately used to determine the status of children's health knowledge, skills, or attitudes to determine how the child might benefit from further learning experiences. The most appropriate assessment involves observing the child while he or she is performing or demonstrating knowledge. Observation may be supplemented with a health knowledge checklist or assessment, such as a picture identification instrument that measures health knowledge in each of the 10 topic areas (Hendricks et al. 1988; Hendricks, Macrina, & Snyder 1991). If such an instrument is used, its use should conform to the NAEYC and NAECS/SDE assessment guidelines (see pp. 16–17).

Having learned roughly what the child's health knowledge and skill level are, the teacher can use developmentally appropriate, hands-on learning activities, as well as modeling healthy behavior and encouraging parents to model and be actively involved in their child's learning. Within a relatively short period of time, most children will reach an appropriate level of health knowledge and practices. Because health education topics involve ideas directly relevant to the child—such as "How do I grow?" and "How can I help my family?"—they stimulate the child's natural curiosity and desire to learn. Early childhood educators work with children who are eager to learn about their bodies, how each part works, and what to do to become like grownups whom they admire (Pollock & Middleton 1989).

One strategy for determining the age appropriateness of a specific objective or indicator of a standard, or to adapt for individual differences on the developmental curriculum, is the learning cycle proposed by Bredekamp and Rosegrant (1992; see also this volume, pp. 19–21). The same content goal may be included in the curriculum in different ways depending on whether the teacher's goal is for children to become aware, explore, inquire, or utilize the knowledge or skill. In addition, the achievement of some health education objectives depends on children's level of cognitive development; for example, understanding body systems requires some abstract reasoning ability and is, therefore, more appropriate for children in the primary grades.

## Integrating health education in the curriculum

"Health education works best in the framework of a healthy environment and healthy adult behavior" (Kendrick, Kaufmann, & Messenger 1995, 11). Effective comprehensive health education cannot be addressed adequately with an occasional unit or lesson but must be provided for young children through the classroom environment, daily routines, adult modeling, and direct teaching.

A daily schedule that includes health practices will help young children establish positive health habits. Young children feel comfortable and secure with routines they can depend on. Through daily exposure to health-related materials, activities, and modeling, children will begin to recognize that health is part of their life and personal responsibility.

Health education cannot be left only to routines and incidental learning, however, although the environment, routines, and teachable moments are essential to effective health education. Specific teaching that focuses on health is also needed. At the same time, the very nature of health education promotes integration with other disciplines, including science, math, physical education, language arts, music, and art.

***KEEPING PARENTS INFORMED OF THE SCHOOL'S HEALTH GOALS AND ACTIVITIES AS WELL AS CONCERNS IS IMPORTANT BECAUSE SOME HEALTH EDUCATION GOALS ARE BEST ADDRESSED AND REINFORCED BY PARENTS.***

The importance of health must be modeled by adults. Teachers can set an example and contribute to the health and safety of young children by ensuring that the environment is safe and clean and by engaging children in maintaining environmental health and safety. Of course, teachers should follow proper health and safety procedures, including fire and other emergency drills, medical emergency procedures, handwashing procedures, and management of sick children. Adults must also model by participating in health routines such as handwashing and toothbrushing (proper procedures are described in Kendrick, Kaufmann, & Messenger 1995). Teachers who do not participate in health and physical activities and have not maintained their own physical health are not as effective in helping children develop responsibility for their health and fitness. An ongoing health training program for staff and parents may enhance the health education program for children.

Parent involvement is an important component of health education for young children. Keeping parents informed of the school's health goals and activities as well as concerns is important because some health education goals are best addressed and reinforced by parents. Parents should be invited to participate in health routines, contribute materials for learning centers, and share with children how they work toward a healthy life. Programs serving children can offer health education for parents, most of whom can benefit from and appreciate receiving accurate health education information.

Some health education issues are beyond the understanding of young children. For example, some children are confronted at an early age with drug abuse, but they are not able to fully understand the nature of the problem or the information and concepts relating to it. Although children should not have to protect themselves from unsafe and unhealthy situations, many children experience these conditions each day.

When a goal or topic is potentially frightening or disturbing, teachers must take care not to confuse or upset children. They need to break down complex goals into simple, concrete concepts that children can grasp. For example, substance abuse activities can focus on helping children understand that too much of anything is not healthy and does not feel good. Of course, children cannot be allowed to explore and use drugs; they must be directly taught safe behavior. However, teachers can use a frame of reference that allows children to construct their own understanding through experiences, such as, "How would you feel if you ate too much?" ("I would have a tummy ache") or "How would you feel if you ran too much?" ("I would be tired").

Parents should be the primary vehicle for achieving the goals of health education with young children. The relationship between home and the early childhood program can serve as an important link for children as they learn positive health habits. A strong family component of the total health education program will increase the program's chances of success.

## Appropriate health education content

The Association for the Advancement of Health Education (AAHE) lists 10 topics relevant to comprehensive health education (1990). The following sections provide descriptions of each topic as it relates to goals, classroom environment, routines to reinforce, adult modeling, and direct teaching ideas. The boxes on pages 66 to 68 illustrate how integration of these 10 topic areas can effectively address each of the performance indicators for health instruction of the National Health Education Standards. All of the standards can be addressed to some extent in kindergarten through Grade 4, although Standard 3 is most applicable for preschool. Teachers should review scope and sequence charts of existing comprehensive health education curricula (*Growing Healthy* 1982; Actions for Health 1992) and consider the cognitive level of the children they teach to determine the appropriateness of each performance indicator for their grade level.

### *Personal health*

The overall theme of health education for young children is personal health. Children should become aware of their bodies in their entirety and recognize that their behavior directly affects their development and maintenance of a healthy body. Because present behavior and choices influence future quality and length of life, promoting positive health habits with young children is imperative.

The primary goal of studying personal health is to help children establish positive health habits and begin to understand that they are responsible for their own health. All other components of the health education curriculum build from and contribute to the achievement of personal health.

The learning environment should include hands-on health-related materials that will reinforce children's health concepts. Health materials can be added to learning centers throughout the early childhood classroom. For example, nutritious food containers or water for washing baby dolls may be added to the housekeeping area, safety signs added as props in the block center, exercise clothing and accessories added to the dramatic play area, and health-related books placed in the book center. In addition, special learning centers, such as a doctor's or dentist's office, can be introduced at times. The addition of such health materials provides opportunities for children to become aware of and explore health concepts. The same material may create awareness for one child while allowing another child to apply prior learning.

Although specific activities on personal health may be used to introduce or focus attention on a topic, this goal is achieved primarily through children's daily routines that model the desired lifelong behavior. The daily schedule should begin with the teacher's observation of each child's general health and appearance and include time for children to interact with each other and materials, eat nutritious foods, brush teeth, wash hands, be physically active, relax, and rest as needed. Including time for children to informally interact with peers helps them recognize observable differences between children, such as size and physical ableness. Young children are naturally curious about each other and will move from awareness and exploration of differences to inquiry about how each child grows and develops in his or her own way. From these experiences children learn to describe the growth and development characteristics of many living things. Teachers must be aware of young children's typical ways of perceiving and thinking when discussing living things. For example, when asked if a car is alive and how she knows, 2-year-old Katie says, "Yes, 'cause we have one." Six-year-old Zachary says, "It's only dead when it runs out of gas." Eight-year-old Breanne says, "No, because it's not." Asking open-ended questions to encourage children in thinking and talking about their ideas can extend their understanding. Teachers may respond by asking questions such as, Do you have anything that is not alive? What else do you have that is alive? How do you know a car is dead when it runs out of gas? Is a car dead if it has flat tires? How do you know a car is not alive?

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The daily schedule must include time for physical development and encouragement of children's natural desire to move. Their awareness of movement and exercise helps them begin to understand that exercise helps their bodies grow strong. The daily schedule should include relaxed mealtime, with nutritious foods available. Nutritious foods served for school meals and snack create an awareness that a variety of nutritious foods helps their bodies grow strong and is the

foundation for nutrition education. Personal hygiene routines, such as brushing teeth and washing hands, are important health habits for young children to acquire. Time spent practicing, modeling, and discussing these tasks is more valuable than any lesson taught about them. Children become aware that teeth need to be kept clean and can brush their teeth, with adult supervision, at a very early age. When put to bed without brushing her teeth, even a 2-year-old may say, "I need to brush teeth." As children practice brushing their teeth with adult guidance, they develop greater skill in correct brushing. During the early primary years, they are ready to learn about the structure and function of teeth.

A daily routine that incorporates health education encourages children to relax and rest as needed. Because preschool-age children have different needs, rest should be allowed on an as-needed basis. Helping children recognize when they are tired takes them a step toward being responsible for their health.

Teachers introduce topics such as body systems through the daily routine by providing time for children to use their senses and body parts together but also through direct teaching activities. Teachers can help children see how their body parts and senses are related by making comments such as, "Use your nose to smell lunch. What does it smell like?" Children can savor the feel of soap bubbles and running water when washing their hands. Teachers can encourage conversation about these sensory experiences. Preschool children gain a fundamental understanding of the body, for example, when they learn that we see with our eyes and hear with our ears. Children in the early primary grades will begin to learn, for example, about the structure of the eye and ear, how the skeletal and muscular systems work together, and how to describe a single body system.

### *Emotional and mental health*

Emotional and mental well-being contributes greatly to personal health and is essential to the quality of life. Emotionally healthy individuals are more able to cope with situations in life and to choose appropriate actions; they recognize and express emotions comfortably and appropriately, communicate and cooperate effectively with others, and develop and maintain interpersonal relationships. The goal of emotional and mental health is to help each child develop a positive self-concept and the ability to identify and express his or her own emotions.

If designed for independence, the physical learning environment can promote children's self-esteem and build their skill and confidence. Low shelves, with a wide variety of appropriate materials in labeled areas for easy return, can facilitate children's independence. Self-help skills are enhanced through activities such as pouring juice from juice containers that are not too big, heavy, or full. Such a child-centered environment responds to children's desire to help themselves, from the 2-year-old's, "Me do it!" to the 8-year-old's eagerness to be treated like a big kid. Learning centers should be set up to allow children to develop independence and success. As children build skill and confidence, they are better able to recognize their own rights and show respect for the rights of others.

Like personal health, emotional and mental health must be addressed on an ongoing basis, involving much more than a unit on feelings or manners. Regular interaction between children and others, including appropriate touch, smiles, and positive support, contributes to the goal of emotional and mental health. Adults must strive to build positive relationships with children, dealing with their misbehavior in a positive way that encourages self-control, giving directions and encouragement, listening, and answering their questions. By modeling patience, understanding, and a positive attitude, adults help children develop their own positive emotional and mental health.

Teachers can help children explore various feelings and appreciate that emotions are very individualized. Three-year-olds become aware there are different emotions and begin to explore ways to express these emotions. For example, a child who feels anger may appreciate that is OK and normal to feel certain emotions and, through guidance, recognizes that there are appropriate ways to express these emotions. By age 7 or 8, children can better express their feelings verbally. As with any health behavior, appropriate expression of emotions requires the support of adult guidance. It is *not* appropriate or even desirable to expect children to *control* their emotions; instead, adults should guide children toward *appropriate expression* of emotions.

Manners, as social knowledge that must be taught, are practiced through communication with others; therefore, the daily routine should allow time for children to communicate with each other. The teacher's role is to model appropriate communication and behavior, encourage peaceful conflict resolution, and facilitate social behaviors such as cooperation. Among the many useful resources to guide adults in encouraging cooperation is Elizabeth Crary's *Kids Can Cooperate* (1984).

Learning experiences focused on emotional and mental health are acceptable as long as this approach

is not the only one used. Sample emotional and mental health plans included in *Here We Go . . . Watch Me Grow!* (Hendricks & Smith 1991) are "Identifying Emotions," "What I Like About Myself," "Feeling Sad," and "Social Behavior." *As I Am* (Action Opportunities, Inc. 1988), a U.S. Department of Health and Human Services mental health curriculum, includes chapters on "Being," "Feeling," "Relating," and "Thinking." Reading and discussing children's books such as Judith Viorst's *Alexander and the Terrible, Horrible, No Good, Very Bad Day* (1972) can be an appropriate emotional and mental health activity for young children.

### *Family life*

"The family" is a common theme in early childhood classrooms. Unfortunately, these experiences often focus on a "traditional American family," which is no longer the norm. Today children and adults live in a variety of family configurations, including single-parent, two-parent, shared-custody, blended, adoptive, foster, interracial, and lesbian and gay households. Many variations of extended families exist, in which family members other than the biological parents are raising the children. Young children should be aware that many different family structures exist and be comfortable with their own family structure. A child can recognize that he or she is an individual member of a family and, as such, has certain rights, privileges, and responsibilities, as do other family members. A supportive family environment requires combining these individual rights and responsibilities. Children should *not* be made to feel responsible for a healthy family structure; for example, they must not be made to feel as if they are the cause of the dissolution of their family from divorce or death.

An early childhood program's general philosophy of parent involvement shapes the way family life is conveyed in the early childhood class. For instance, involving families in the classroom familiarizes children with different family structures. Teachers can help children become aware of family structures and vocabulary for relatives by introducing family members who visit the classroom. Answering children's questions about family members entering the classroom will also serve as a way to help children see different types of families. Upon entering a classroom to pick up his niece, a man is immediately asked, "Whose daddy are you?" They learn that he is not a child's daddy but that he is Morgan's uncle. Awareness of their own and other families helps children see likenesses and differences. The ability to distinguish family structures precedes the ability to explain the ways in which family membership changes (e.g., divorce, marriage, birth, death). Parents and guardians can participate in the daily routines and be special guests who share information about their families.

Adults' values also are represented in the physical learning environment. Pictures of all types of families should be displayed regularly. Each learning center can include family-related materials and pictures. A male figure may represent Daddy to 3-year-old Adam and Uncle Stan to Breanne. Books should be selected that represent many kinds of families. *Who's in a Family?* (1995), by Robert Skutch, is an example of a book reflecting acceptance of different families. Books that are not focused on families but represent many families throughout the story should also be included. Pictures of children in the classroom and their families make a great addition to the classroom environment.

Individuals' own family structures are likely to influence their attitudes and ideas about families. Teachers must accept family structures unlike their own so that they convey this acceptance to children. Acceptance goes beyond saying that "all families are OK" during a class unit. Without an open mind the teacher will have difficulty adequately helping children develop healthy family life attitudes and knowledge. Teachers should be cautious *not* to say, "Take this note home to your mom." Some children may not have a mother at home, or maybe they have two. Routines send messages about how we value families. *Anti-Bias Curriculum: Tools for Empowering Young Children* (Derman-Sparks & the A.B.C. Task Force 1989) provides guidance on building an environment that combats bias.

Children need to develop an understanding of family responsibility by identifying ways to help at home and seeing the different jobs of various family members in their home and in others. This will lead to an understanding of the responsibilities of each family member.

### *Nutrition*

A fundamental goal of nutrition education is to foster awareness of different types of foods and to promote exploration and inquiry into food choices. Children begin to develop eating habits even during infancy as they learn that we eat when we are hungry and that foods have different tastes. During early childhood, lifelong habits with foods are developed. Through nutrition education, we encourage children and adults to include a wide variety of foods that provide adequate nutrients in their daily diet.

To foster an awareness of different types of food, teachers can include in the learning environment pictures

and models of healthy foods, such as fruits and vegetables; food containers; and real food. The physical environment may also include a gardening space, either indoors or outdoors, where children can plant seeds, tend the garden, and watch for produce to grow. Field trips to grocery stores, produce markets, farms, gardens, orchards, restaurants, kitchens, or other places where food is grown or prepared can expand nutrition education experiences.

A daily routine that includes healthy meals or snacks and in which teachers model healthy food choices is the most important contribution a school can make to nutrition education. Unfortunately, many schools serve meals and snacks that are not nutritious. Teachers and parents can work with the school administration or the parent–teacher association to encourage healthier meals. Cooking activities enable children to learn many concepts in addition to nutrition and should occur regularly.

Successful nutrition education requires a strong family component. A child may know that milk or juice is more nutritious than cola, but if she regularly receives soft drinks at home, she probably will not exercise healthy food choices. Because some parents may be unaware of healthy lunch or snack foods, it may be helpful to provide lists of foods or simple recipes for fun foods that are high in nutrients; are low in fat, salt, or sugar; and look and taste great. This strategy, of course, is most effective when the school or program also serves nutritious foods.

Learning experiences focused on nutrition may enhance learning about nutritious food. Special learning projects related to restaurants, grocery stores, and gardening promote nutrition education. Children age 3 to 4 years can recognize different types of foods and understand that some foods are better for your body than others. By age 5 or 6, children can select the more nutritious foods and may be more interested in how foods help their body grow and develop. However, their food selections are still primarily based on taste and the feelings associated with specific foods. By age 7 or 8, children are becoming more capable of making healthy food choices. In the early primary grades, children generally are able to categorize foods in the different food groups or food pyramid and to classify foods according to their principal nutrients. At this age, children should be able to plan a simple, balanced daily diet.

### *Disease prevention and control*

Many diseases are preventable through lifestyle changes. Adults can prevent some infectious diseases through immunizations and universal precautions such as handwashing, sanitizing play materials and furniture, and avoiding contact with potential germ carriers, such as blood and body fluids. Another important practice is to seek appropriate medical attention for prevention or detection as well as treatment of disease.

The goal of prevention and control of disease in young children is accomplished by encouraging the practice of personal cleanliness and hygiene. Teachers should not mention specific diseases with 3- and 4-year-old children because this knowledge may be frightening or confusing. For preschoolers, the objective is to understand that health habits help to prevent disease.

Providing a clean and healthy physical environment is essential in early childhood programs for the prevention and control of diseases. A complete discussion of the policies and procedures necessary for preventing illness is beyond the scope of this chapter and available elsewhere (*Accreditation Criteria* 1991; APHA & AAP 1992).

An example of an important health standard that can also become part of the health education curriculum is handwashing. Promoting regular and correct handwashing can help children to actively avoid germs. Children should be reminded to wash their hands before eating, after toileting or cleaning their nose, and before and after playing in the sand/water table. Adults should model for children by washing their hands at the beginning of the work day, after toileting or helping a child with toileting, after assisting a child with cleaning his nose, and prior to food preparation, serving, or eating.

Adults should model personal hygiene and disease prevention in other ways. Helping children learn to cover their mouths when coughing and their noses when sneezing encourages good personal hygiene. Following the "universal precautions," staff must wear gloves when necessary to avoid contact with blood, body fluids, or other potential germ carriers to prevent the spread of disease spread among staff and children. As staff model good hygiene habits, they can talk to young children about how many different germs can cause diseases, how germs are spread, and how to avoid germs.

### *Injury prevention and safety*

Unintentional injury is the leading cause of childhood injury and death and remains the leading cause of death for adolescents and young adults as they engage in high-risk behavior. Many injuries may be prevented through creating a safer environment, providing proper supervision, and influencing children not to engage in certain high-risk behaviors, such as

riding a bike without a helmet or in a car without a seat belt. Safety education is most effective when it is presented *before* the individual engages in the high-risk behavior, that is, during early childhood. The National School Safety Center (1990) developed *Child Safety Curriculum Standards* for children of kindergarten age and older on the following topics: bullying, child abuse and neglect, gangs, latchkey children, nonfamily abductions, parental abductions, runaways, sexually transmitted diseases, substance abuse, teen parenting, and weapons. Many of these topics are very difficult for young children to comprehend and should be included in the early childhood curriculum only if teachers carefully tailor them to the children's developmental understanding.

The goal of safety education is to help children develop skills in injury prevention and safety. Young children can learn to avoid injury by applying a few simple, consistent rules, such as wearing seatbelts, even though they are too young to understand the reasons for such rules. Two-year-old Morgan says, "My seatbelt on" as she gets into a vehicle. Although Morgan lacks the skill needed to buckle the seatbelt and does not understand the life-threatening consequences of not wearing a seatbelt, she is developing a positive habit.

Adults are responsible for providing safe environments for children. They must check the rooms and playgrounds frequently to ensure that the materials and equipment are in good repair. Adults must closely supervise children while also encouraging independence, for example, they should remind children to push their chairs under the table and to wipe up spills. Teachers should also encourage children to use language to inform adults of potentially unsafe situations, such as the presence of trash or glass on the playground.

Focused teaching may include traffic signals and signs, community safety helpers, safety rules, poisons, seatbelts, fire drills and other areas. A unit on fire safety and burn prevention, such as the *Learn Not to Burn Preschool Program* (National Fire Protection Association 1991), can be effective when integrated with a comprehensive health education program and can be reinforced through routines and modeling. Projects help children focus on the subject, while routines reinforce the concepts.

Because many young children in the United States are regularly exposed to weapons, the topic should be part of health education. Children should be taught to tell an adult immediately if they see a weapon, even if they think it is a play one. Although children cannot comprehend the real danger of weapons, adults should teach peace education and nonviolent conflict resolution to assist the children in understanding (Slaby et al. 1995).

***MANY SAFETY TOPICS ARE VERY DIFFICULT FOR YOUNG CHILDREN TO COMPREHEND AND SHOULD BE INCLUDED IN THE EARLY CHILDHOOD CURRICULUM ONLY IF TEACHERS CAREFULLY TAILOR THEM TO THE CHILDREN'S DEVELOPMENTAL UNDERSTANDING.***

Another important topic included in safety curriculum is personal safety. Unfortunately, many personal safety curricula do not consider children's inability to comprehend them, nor are they sensitive to the fact that young children are defenseless against abuse in most cases. For example, when Breanne was 4, she was told not to leave preschool with anyone who did not know her secret word, "watermelon." When Dennis, a friend of the family, stopped by and told Breanne that her aunt said for her to leave with him, Breanne said, "No." She explained that she could only go with people who knew her secret word. Dennis guessed several words, but none of them were right. He asked Breanne what her secret word was, and she whispered, "Watermelon." Breanne followed the instruction given to her but did not understand well enough for it to protect her. She needed further instruction—"Do not tell anyone your secret word." This anecdote illustrates the importance of close adult supervision for young children.

Encouraging young children to express themselves is the most important step toward personal safety. Focused study on personal safety, with specific examples of situations and role playing, is more effective for 7- and 8-year-olds because they can comprehend the situation and consequences; however, children older than 6 still need adult protection. Children must be able to depend on adults to protect them, so parent education in injury prevention and safety is important. Training sessions, newsletters, brochures, and other approaches can be used to inform parents of safety issues (Hendricks 1995).

### *Community health*

Preparing children to continue toward community-wide health is the long-range goal of this dimension of the health curriculum, while a more immediate goal is for young children to become familiar and comfortable with health helpers. Teachers must have knowledge of health workers, organizations, and resources, as well as the ability to work as a team member, to meet these goals.

Community health materials can be added to each center of the preschool classroom. Books should be selected to show a variety of community health workers, including women and people of color. Pictures added throughout the room can create an awareness of community health. Dress-up clothes and props for playing nurse, doctor, and exercise instructor enhance dramatic play. Special health-helper centers can also be designed, for example, a medical doctor office, dentist office, health department, and eye doctor office. These scenarios provide preschool children the opportunity to work through some of their questions and fears in dramatic play.

Medical and dental experiences may be frightening to children, especially if their only experience involves unplanned trips when they are ill, injured, or receiving immunizations. Adults can reduce children's anxiety by helping them become familiar with medical and dental tools, simple medical procedures, health professionals, and the screening process. Health screening can be a positive way for children to meet health professionals. Some early childhood programs and schools provide this service for enrolled children.

Young children should be introduced to health helpers. Because some children may have never visited health helpers, they will need firsthand experiences to enhance their awareness. Visiting health professionals and community health–related sites can provide a better understanding for young children. During visits to bookstores or libraries, teachers can show children the many books written for children and adults about health. Visiting exercise and health facilities can be an active field trip during which children could experience the service offered. Health professionals could also be invited into the classroom as special guests. It is important to select professionals who can relate well to the children.

Community health projects are an ideal way to introduce children to health helpers. Adults must pay careful attention to ensuring that the activities and materials for children are not biased; for example, pictures and language about doctors should not imply that all doctors are all White men.

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Early childhood staff serve as models for the children and parents. Teachers should share community health information informally through references to their going to the dentist, reading a health book, or modeling community health behavior by participating in local "runs" or "walks." Parent education through training, conferences, and literature may encourage families to become actively involved in community health and to better use health resources.

Older children can become more involved in community health issues by becoming part of a team. The teams should be small and informal and should begin with short-term projects, such as conducting a bicycle safety day. This experience can help children begin to see that individuals can work together to solve community-wide health problems. The daily routine must support teamwork, and adults should model collaboration and cooperation.

### *Substance use and abuse*

Substance use prevention must be included in health education to help children make informed decisions about *all* substance use, including tobacco, alcohol, over-the-counter and prescription medicines, and other drug use and abuse. Often we think only of drug "abuse" and overlook the importance of helping children understand the benefits of the proper use of medicines, such as immunizations and antibiotics, which have saved countless lives of both children and adults.

The best way to address substance use and abuse in early childhood health education is through parent education and support. Keeping parents informed of the dangers to children of *all* drugs, including legal drugs and alcohol, is important. Teachers should address safety issues, such as keeping alcohol, vitamins, aspirin, and other medicines in child-resistant containers and out of reach. Information about indirect dangers, such as cigarette smoke, should also be included in the parent education program. Because substance abuse is such a complex and sensitive issue, it may be necessary to coordinate with many agencies to address the issue in the parent education component.

It is the adult's responsibility to protect children from the potential dangers of substance use and abuse. Unfortunately, some adults do not fulfill their responsibility. Too many young children are exposed to substance abuse, and they are not capable of understanding much about it. They are powerless to protect themselves from something they cannot understand and may become very frightened or confused when faced with abstract concepts. Substance abuse is a growing concern and receives much media attention; therefore, children regularly hear information about drugs and slogans such as "Stay away from drugs." Children's familiarity with such slogans may lead adults to believe that children understand more about this topic than they really do.

Many early childhood substance abuse curricula are inappropriate for young children. It is not necessary to expose young children to information about specific illegal drugs, and telling children to leave a place where people are using drugs may be dangerous, especially if drugs are used in their homes. The best way to include preventive drug use in early childhood curriculum is to focus on building children's self-esteem and their decision-making and problem-solving skills. *I Can Problem Solve* (Shure 1992) is a preschool problem-solving curriculum that provides examples of activities. The High/Scope curriculum *Educating Young Children* (Hohmann & Weikart 1995), *The Creative Curriculum* (Dodge & Colker 1992), and *Actions for Health* (1992) also encourage decision making and problem solving. These skills are not taught in a unit but are developed every day in many ways for all ages of children. Elizabeth Crary's *Kids Can Cooperate* (1984) is a resource that provides suggestions for helping primary-age children learn to problem-solve and make decisions.

Drug prevention can also be supported by increasing children's knowledge about medicine. Young children can begin to understand when it is appropriate to take medicine and who may appropriately give medicine to them; however, they will not understand this enough to protect themselves. Also, although most children can easily understand why they take medicine when they are sick, they may have difficulty understanding that medicine can also be used to prevent illness. For example, Morgan, 2 years old, says, "I'm sick?" when given a vitamin. A child entering kindergarten may question why he needs an immunization when he's "not sick."

Three- and 4-year-olds can focus on the concept "too much." They can learn about "too much" by experiencing things that are too heavy to carry, clothes too big for a doll, clothes too little for them, and too many blocks for a container. The "too much" concept becomes subjective when the substances discussed are not concrete, such as tobacco, drugs, and alcohol; therefore, study of this concept should continue through early primary education. Five- and 6-year-olds can realize that cigarette smoke smells bad and that any kind of smoke is harmful to breathe. Seven- and 8-year-olds can better understand the term *drug* and can study alcohol, nicotine, and caffeine as drugs in a simple way.

### *Consumer health*

The goal of consumer health is twofold. First, children need to understand that the purpose of advertisements is to sell products. Second, children need to see how advertisements promote both health- and non–health-promoting products. Consumer health is best included as a topic of focused study on identification of advertisements and recognition of health-promoting products.

To help children recognize health-promoting products, adults can provide empty containers for shampoo, toothpaste, sunscreen, and other health-related items for children to use in dramatic play. Health product coupons and flyers can be used in role play for young children. Children who are able to read can peruse the coupons and match them to product containers. A health products store could be set up as a special dramatic play center. Older children could research items to be included in a store. Product containers could be added for children to use in art projects, such as making collages or paintings, or they can be added to the block area for the children to haul in toy trucks. Containers of various types could also be added to the sand and water play area. Matching container lids to the containers could be a game that would develop fine motor skills as well as eye–hand coordination. Containers can also be used to make puzzles or lotto games to help children recognize letters and words that relate to health. Coupons could be redeemed at a health products store center. Visiting drug stores to look for health products can extend the children's experience beyond the classroom and home. Children may see products familiar to them, as well as many that are not.

Using health products as part of the daily routine helps children understand what the products are. For, example, providing toothpaste and toothbrushes for each child encourages preschool children to brush their teeth daily. After cleaning cuts and scrapes, adults can provide adhesive bandages for children to use as needed.

Preschool children may not be able to distinguish between an advertisement and a children's program on television, especially because famous characters are portrayed in both commercials and cartoons. However, preschool children can become aware of the power of advertising. Through experimental activities, 5- and 6-year-olds can learn to recognize some truths and myths of specific advertisements. One example of an experimental activity is to show a toy commercial to children and encourage a discussion. The toy could be provided for children to play with and examine. Following the hands-on experience with the toy, the commercial should be seen again and discussed to determine whether it was accurate or misleading. Seven- and 8-year-olds can recognize advertisements in print and on television and may also be able to recognize advertisements selling ideas (religion, political candidates, etc.). A collection of advertisements could be included in the classroom for children's review. Children can be involved in projects to advertise or publicize events for the classroom or program. An art show, music festival, or other event could be planned and advertised with flyers, signs, radio and television public service announcements, and newspaper articles.

Three- and 4-year olds can recognize health products such as soap, shampoo, and toothpaste as health-related products. Five- and 6-year-olds can identify health-related commercials. Seven- and 8-year-olds should have the opportunity to analyze reasons for choosing commonly used health products and should engage in consumer health projects, such as making commercials and writing advertisements—projects that incorporate other subject areas (e.g., math, science, reading, writing).

### *Environmental health*

The goal of environmental health education is for individuals to recognize that their behavior directly affects their environment, which has a tremendous impact on our health and the health of future generations. Environmental health education is compatible with early childhood education—both include encouragement of natural curiosity and concrete activities to extend learning.

Environmental health must be an ongoing effort incorporated into the daily routine for all ages. Adults' interest and respect (or lack of) for the environment is apparent to children. Children can focus attention on environmental health through projects that bring about changes in behavior, for example, a recycling project that instigates an ongoing system for recycling both at home and at school. Parent involvement in such projects extends environmental health education.

Providing a clean environment for children serves as an example of environmental health. Trash and recycling containers should be convenient for adults and children. Throughout the routine of the day, adults should model taking care of the Earth by picking up trash on the floor or ground. Discussing the need to care for the environment and pointing out natural beauty sends children a powerful message.

Young children demonstrate an interest in their environment if provided the opportunity and encouragement. Inspiring children to develop an awareness of and interest in the natural environment helps them to take an important step toward environmental health. The early stages of environmental health education include children using their senses to investigate and learn about the outdoors. Caring for plants, flowers, and pets also contributes to environmental health. Teachers should respond to young children's curiosity and questions by providing accurate information. Books about the earth, plants, and animals, such as *Brother Eagle, Sister Sky* (Chief Seattle 1991), are appropriate additions to the book center.

With guidance, 5- and 6-year-olds can participate in environmental advocacy projects. Seven- and 8-year-olds are better able to understand concepts such as pollution, but they still need concrete activities to make the concepts meaningful to them. Specific areas of environmental study, such as recycling and recognizing pollution of the air or water, are appropriate for children in the early primary grades if they include meaningful experiences for children.

## Conclusion

The early years are crucial to the development of behaviors that contribute to good health, and early childhood teachers can significantly enhance health learning opportunities for young children by providing appropriate experiences. Early health education can begin children on a lifelong process of learning about themselves and their relationships to others and to the world around them. Health education for young children must be incorporated into everyday routines and the environment as well as being the focus of projects and thematic studies. Early childhood educators have before them the challenge to live a healthy lifestyle to benefit themselves and the children they teach.

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# 7

# Transforming Curriculum in the Visual Arts

*Christine Marmé Thompson*

One morning several years ago, departing from my rounds as supervisor of preschool and kindergarten art classes offered each Saturday for teacher education purposes in the School of Art and Design at the University of Illinois, I stopped to visit my son, Paul, and some old friends in the first- and second-grade studio. Paul was in the process of completing a ceramic elephant, Babar rampant, with basketball in hand. He confessed that he was having some trouble convincing the King of the Elephants to maintain his regal pose. As I offered suggestions and steadied the form while Paul made adjustments, one of his companions asked, "Are you an art teacher?"

Paul responded on my behalf, "Yeah, she teaches preschool and kindergarten, and college kids."

Erik piped up, "I wonder how you teach those little guys anything."

"You think that would be tough?" I asked, intrigued by Erik's question. "You bet," he replied. "I have a little brother who's in preschool, and he just draws *one* line, and he says it's a snake!"

We talked, for a moment or two, about the ways that children's drawings evolve. I assured Erik that there was every reason to believe that his brother's snakes would eventually become more complete and recognizable—curvier, fatter, more detailed. I suggested that there may have been a time when Erik himself considered single lines or very simple shapes to be good, economical solutions to the problem of representing the objects and creatures he wanted to draw. Momentarily reassured that his little brother's case might not be as hopeless as he feared, Erik turned his attention back to his work.

We know that children's drawings change rapidly during the early childhood years, evolving from their first faint, random marks to complex representations of people, objects, and events. As this conversation with Erik indicates, young children's attitudes toward art—their understanding of how it is made and valued, learned and taught—also undergo constant reappraisal and revision. Eight-year-old children expect different things from the drawings they make and from the drawings they see around them than do 3-year-olds. Proponents of the child-centered forms of art education that are familiar to North American teachers and parents recognize such differences as the basis for developmentally appropriate practice.

But just as surely as children's drawings change over the course of childhood, so do the perspectives that adults bring to the process of teaching and learning. New circumstances, experiences, and ideas about young children and their development and learning require new interpretations and approaches. As cultural attitudes toward art and toward childhood change (Leeds 1989; Korzenik 1995), so do the philosophy and the practice of art education.

Not so long ago, most children taught themselves to draw while sprawled on their living room floors. We thought of early artistic ventures as solitary and self-sustaining. Educators and psychologists who wrote about children's art often directed their remarks to parents, the adults who were closest to this process and most likely to exert an influence upon it (see, for example, Lowenfeld 1954; Lark-Horovitz 1976). Today many more children begin to explore art materials, and the marks and meanings they can make, in classrooms or child care settings outside their homes. This fundamental change in the lives of young children, and in the responsibilities of their teachers and parents, highlights the role that environment, experience, and encouragement play in children's learning experiences, even in the acquisition of such basic and universal behaviors as gesture, speech, or mark making.

We now recognize that children's art is not an automatic consequence of growth or development but the result of an active process of exploration and inquiry that cannot occur without some facilitation by adults (Zurmuehlen 1990; Kindler 1995; Thompson 1995). Very young children cannot make drawings or work with clay or paint unless adults provide appropriate materials and the time, space, and opportunity to use them. As our opportunities to observe children making art in classroom settings increase, we have realized that even regular access to carefully selected materials is not enough to guarantee that children are learning anything positive about art or, through art, about themselves or their world. Children need interested adults and other children to listen to their plans, respond to their ideas, and offer assistance and support for their explorations of visual forms and meanings (Vygotsky 1978; Brittain 1979; Dyson 1986; Thompson & Bales 1991).

Given the slightest opportunity and encouragement, virtually all children begin to create drawings and paintings and sculptures with assurance and intensity. The ability to create visual images and the ability to interpret images that others have made are universal human potentials that can be enhanced—or extinguished—by education. We need only consult the adults around us to realize how fragile the artistic

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confidence we possessed when we were children can be. Adults who experienced art as a discouraging or futile pursuit when they were children learned to consider themselves artistically inept and came to feel excluded from the domain of artistic activity (Sarason 1990). Lacking any experience in their own lives that would convince them otherwise, many teachers believe that art is reserved for a talented few, that it requires a special ability that is bestowed at birth and cannot be acquired or developed later in life.

Easels, clay tables, drawing and collage centers, and all the paraphernalia they require are placed prominently in most early childhood classrooms. Many teachers of young children believe that art is vital for young children, for any number of reasons (Seefeldt 1987; Kindler & Darras 1994) and schedule time and space for a variety of art experiences in their classrooms and curricula. Artistic activity has always been central to progressive movements in education, being recognized as one of the primary ways that children can learn by doing and document what they learn (Dewey 1934). Many teachers who incorporate the writing process into their programs are impressed by the drawings young children produce when they are encouraged to draw each day in personal journals (Graves 1984; Hubbard 1985; Dyson 1986). Other teachers who follow a whole language or project approach discover that children who are encouraged to pursue a medium or topic seriously for an extended period of time are capable of creating surprisingly complex and sophisticated works of art (Katz & Chard 1989).

Many teachers are fascinated by the spectacular accomplishments of the children who attend 22 municipal preschools in the northern Italian town of Reggio Emilia. Among several features seldom found in North American early childhood programs are a lavishly equipped *atelier,* or art studio, and its own full-time art teacher. Katz describes one of the primary lessons she has learned from her visits to Reggio Emilia: that young children can use graphic languages—painting, drawing, collage, construction, and so on—"to record their ideas, observations, memories and so forth . . . to explore understandings, to reconstruct previous ones, and to co-construct revisited understandings of the topics investigated" (1993, 20). She is now convinced that "many of us in the United States seriously underestimate preprimary school children's graphical capabilities and the quality of intellectual effort and growth it can stimulate" (pp. 20–21).

For many teachers of young children, however, art remains a mystery, something that is universally held to be good for children for reasons that often seem vague or contradictory, overstated or arguable, trivial or obscure. Children's art may be something of an acquired taste. Teachers who are unfamiliar with the natural progression of forms and images that young children produce may be perplexed by the persistence of scribbles or the appearance of five-legged dogs, precariously balanced chimneys, and humans sprouting arms where their ears should be. It is tempting (but ultimately futile) to simply "correct" what seem to be glaring errors in children's drawings and insist upon more conventional forms of representation. It is easy to become frustrated with children's natural styles of drawing and painting, impatient with the leisurely pace of their evolution, anxious for more predictable and sophisticated results. Teachers and parents sometimes resort to highly directive methods of "teaching" young children to draw, or they limit children's use of art materials to "fabrication activities" (Gaspar 1995), which limit children's choices and encourage replication of an adult-produced model.

***CHILDREN NEED INTERESTED ADULTS AND OTHER CHILDREN TO LISTEN TO THEIR PLANS, RESPOND TO THEIR IDEAS, AND OFFER ASSISTANCE AND SUPPORT FOR THEIR EXPLORATIONS OF VISUAL FORMS AND MEANINGS.***

For these and other equally complicated reasons, art in early childhood settings is often far less inspiring in practice than it is in theory. In some cases, children's encounters with art are structured or presented in ways that are developmentally inappropriate; in other cases, they are not really art experiences. These two dimensions of early art education—developmental appropriateness and artistic authenticity—are crucial considerations for teachers who hope to understand the contributions art can make to young children's lives and learning and to provide occasions for children to experience art in meaningful and productive ways.

In the past several years, art educators have become more directly involved in the preparation of early childhood teachers and increasingly concerned about how to "teach those little guys anything." Art in early childhood is no longer considered an exclusively developmental phenomenon but also a form of activity that can be taught and learned. A more inclusive definition of the content of art education has evolved, expanding the traditional preoccupation with the process of making art to encourage comparable attention to the many other ways that people experience art as part of their history and culture. The remainder of this chapter will explore these strands of thought and offer

an interpretation of the recently developed National Standards for Visual Arts Education (NSVAE) that is compatible with what we know about young children's artistic development and learning.

## Development and learning in early childhood art

Art educators long believed that child-centered, developmentally appropriate practice in art must begin with an understanding of the ways in which children tend to construct images at various stages of development. Classic descriptions of children's art, compiled by Lowenfeld (1957), Kellogg (1970), and others, divided the course of development into stages. Each stage of artistic development was characterized by a distinct way of solving the problems children encounter as they develop and refine symbols for the objects, people, and events they wish to represent. Stages were a convenient way to condense and convey complex information about visual structures and to describe typical concerns and patterns of change that were evident in children's responses to drawing assignments. Generations of teachers found stages such as those described by Lowenfeld (1957) useful guides in planning art experiences and in monitoring children's progress along what seemed to be a well-marked developmental continuum. Descriptions of children's drawings and the meanings attributed to them varied from one writer to the next, but the basic trends and tendencies that they described were remarkably consistent.

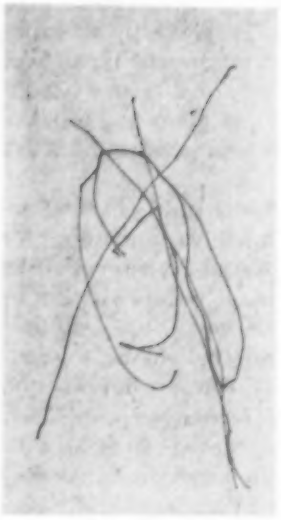
At their best, though, stages of artistic development are no more than approximations—informed predictions of what most children will do at a certain age, given the quantity and quality of art experiences that are available to children in their culture (Eisner 1972; Wilson & Wilson 1982). We are just beginning to appreciate the crucial role that children's experiences and intentions play in the process of learning to create visual symbols. Lowenfeld (1957) advised parents to watch for the appearance of a child's first uncontrolled or random scribbles at 18 months and the emergence of attempts to produce representational symbols at age 4. Now that the value of early marking and drawing activities is more widely recognized—thanks, in no small part, to the work of Lowenfeld and his contemporaries—many children reach these milestones much more quickly. At the same time, there are significant differences in developmental progress among children: Some 3-year-olds draw symbols and images with ease when they enter preschool, but many 5-year-olds continue to scribble through much of their kindergarten year. These variations are normal and usually easy to explain simply by looking at the child's previous drawing experiences.

The greatest difficulty with traditional developmentally based approaches to art education was not in the description of landmarks and tendencies in children's drawing but in the way those descriptions were used to prescribe practice. Vygotsky (1962, 1978) points out that children's "actual developmental level," measured by what children can do when left to their own devices and working without assistance, tells us very little about what those children could do if they were given appropriate guidance and support. Vygotsky believed that a child's actual developmental level should be the starting place for teaching rather than a limitation that teachers are obliged to respect. Research on young children's art provides abundant evidence that children whose spontaneous drawings consist exclusively of nonrepresentational marks can create simple but effective symbolic equivalents for animals (Golomb 1992) or people (Brittain 1979) when asked or encouraged to do so. At the same time, there are clearly moments when children are resistant to instruction or influence. Psychologist Maureen Cox observes that preschool children who have reached the stage of drawing "tadpole" figures (constructed of a circular form perched atop two vertical lines) "seem to be entrenched in their own particular style of drawing the human figure, [while] the older conventional drawers are more open to the influence of others" (1992, 69). Cox speculates that while the younger children are grappling with the essential and universal problem of visual representation, "how a real, three-dimensional object might be represented in a two-dimensional medium" (p. 69), they are not yet ready to entertain solutions demonstrated or described by others.

Children's artistic development is no longer considered immutable or immune to influence, as it once was. But we continue to recognize specific landmarks and accomplishments that mark the course of development and specific principles of visual representation that seem to be especially compatible with children's thinking at specific moments in their lives (Arnheim 1974; Freeman 1980; Wilson & Wilson 1982).

Children's initiation into the realm of artistic activity begins almost by accident, with the discovery that a marker produces some intriguing results when it comes in contact with paper or a wall or a highchair tray (see Figure 1). Scribbles begin as gestures. The toddler who produces her first drawn mark has no intention of making an artistic statement; she is simply waving some *thing* clenched in her fist, and it hap-

***Figure 1***



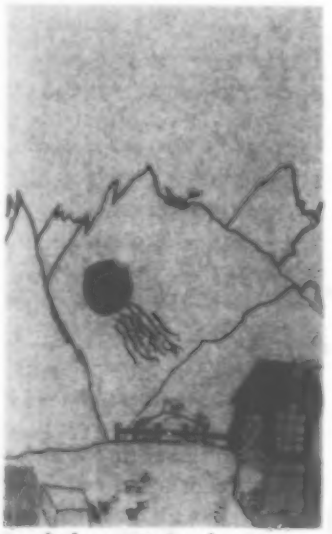
pens to hit a surface. The result is surprising and satisfying enough that it seems worth another try.

Children quickly discover that it is great fun to embellish unadorned surfaces with slashes and blots and sprays of color, to push and probe and refashion lumps of pliable stuff into much-improved versions of itself. As Arnheim (1974) points out, artists never truly outgrow the sheer sensory pleasure of playing with materials that is born in all children when they begin to scribble. Even 2-year-olds seem to be as interested in the results of this activity as they are in the activity itself. Gibson and Yonas (1968) gave toddlers ballpoint pens with the ink cartridges removed, but the 2-year-olds quickly lost interest in scribbling when the activity left no traces of itself. Kellogg (1970) was intrigued by the way that children organized their scribbles on the page in definite "placement patterns"—large, densely layered areas that foreshadow the basic shapes they soon learn to draw in outline. Children seem to make aesthetic choices and visual decisions soon after they discover that they can make marks (Gardner 1980; Zurmuehlen 1983). They begin very early to notice and remember connections between their actions and the outcomes recorded on the page.

As they continue to scribble with increasing fervor, children learn to control, repeat, and place their marks with precision. Eventually they recognize some *thing*—a cat or a cantaloupe or a can opener—lurking in the underbrush of a scribble, waiting to be revealed. This discovery is a momentous one. Suddenly, the familiar concerns of scribbling are joined by an interest in creating images; the child's symbolic activity begins in earnest (Gardner 1980). These early recognitions of similarity between marks and objects are often announced by the child as a drawing nears completion. Initially, before children learn that others around them expect drawings to capture the appearance of things, the connections children notice may not be visual at all. The names they attach to their marks may just as easily refer to an association between the movement of an object and the speed or direction of the strokes they made. A cat may be represented by an arcing flourish, for example, long before it appears as a creature with a body, distinctive ears, and a long tail (Matthews 1984).

At some point, often during the preschool years, children succeed in constructing a form that is clearly, if cryptically, human (see Figure 2). Other objects follow in rapid succession, as each child invents an ever-changing cast of characters and a flexible array of props, ready to assemble on the drawing page. These drawings tend to be simple and economical, basic structures, such as the famous tadpole figure, elaborated in a variety of ways (Kellogg 1979; Gardner 1980; Cox 1992; Golomb 1992). This early representational stage, which Lowenfeld (1957) describes as "preschematic," is a time devoted to experimentation. A child's way of drawing a person or object may change rapidly and radically from one page to the next, as different structures and new ways of embellishing figures are invented, attempted, discarded, or retained.

***Figure 2***



According to Lowenfeld, the "schematic" stage that follows (see Figure 3) is radically different—in the intentions and procedures children bring to drawing and in the character of the work that results. Some preschematic tendencies remain in force: children continue to construct figures part-by-geometric-part and go to some lengths to avoid overlapping shapes. The spatial organization of schematic drawings is clearly something new, however. Objects that once floated on the page wherever space was available now stand firmly planted on solid ground. Figures face the viewer, each posed, somewhat stiffly, to display their most characteristic

***Figure 3***

features: a full frontal view for people, houses, and trees; profiles for animals, airplanes, and automobiles. The orderly world presented in these drawings reflects children's growing interest in the regularities and relationships that exist between disparate objects and events. A no-nonsense literalism may also come into play (Gardner 1980). This type of drawing is virtually epidemic in the primary grades.

***Figure 4***

Eventually, as the content of children's drawings continues to change, the baseline begins to creep up the page, replaced by a more distant horizon line (see Figure 4). Children become increasingly preoccupied with detail, with the subtle visual clues and qualities that distinguish one person or dog or house from another. They attempt to convey a sense of spatial depth by overlapping objects or by utilizing the knowledge, extracted from observation and experimentation, that objects drawn smaller and placed higher on the picture plane seem to stand in the distance. Geometric shapes no longer suffice as drawing components; forms are now drawn with continuous, fluid outlines. Most children begin to explore these issues and effects in their drawings as they approach middle childhood.

Perhaps the most crucial consideration in selecting developmentally and individually appropriate art experiences for young children is whether the child has yet to acquire the notion that marks can symbolize people and things. As Cox's (1992) discussion of tadpole drawers suggests, children must discover and explore fundamental representational concepts on their own before they can respond confidently and without confusion to requests to draw their families or a scene from their trip to the fire station. It is also important to remember that only 30% of 4-year-olds know what they are going to draw before they put crayon to paper, although 80% of 5-year-olds begin to draw with an intention firmly in mind (Chapman 1978). For this reason, teachers are often advised to introduce preschool art experiences primarily through discussions of materials and concepts—large and small, smooth and rough, close and far apart—rather than subject matter or themes (Burton 1980; Smith 1983). The preliminary developmental tasks of mastering tool and symbol use (Vygotsky 1978) seem to be best served by the "classic" exploratory art experiences we associate with the best preschool practice. This crucial groundwork must occur in an environment in which children's unique paces and projects are recognized and respected and good choices are made on their behalf.

Consider the types of materials and physical arrangements that are most conducive to learning for toddlers who are scribbling. Because young children in the process of scribbling may go through piles of paper in a single 15-minute session, thrifty and ecologically responsible adults may be tempted to scavenge scrap paper for the cause. But it is important to remember that children who are learning to control their scribbles, to place and confine them to certain areas of the page, will be best served by markers that contrast strongly with the paper on which they're used (Lowenfeld 1957) and by clearly bounded drawing spaces that allow them to place their marks in relation to the paper's edge (Kellogg 1970). The materials we make available can support or thwart children's ability to see and remember and produce the shapes that they will soon use to construct drawings and letters and numbers.

## Selecting content for the art curriculum: Making and responding to art

What should children do—and learn—when they participate in art activities in early childhood classrooms? How can teachers select and structure art experiences that are engaging, appropriate, and truly educational for young children?

What do young children derive from art experiences that might not come to them in other ways? As Golomb notes, the impulse to make art is not simple or unitary: "Clearly, drawings can provide multiple sources of satisfaction that are at once of an emotional, cognitive, and aesthetic order" (1992, 162). As they begin to make marks, children learn that they can produce tangible changes in the world as a result of actions they initiate and control. Children begin to draw and paint and construct freely and fluently long before they master other, more conventional symbol systems, such as words and numbers. As they draw, children learn that they can observe, organize, and interpret their experiences. They can make decisions, take actions, and monitor the effect of those actions. They can create form and meaning where none existed before. In Buber's (1965) words, children experience themselves as *originators* when they make art.

In the past 30 years, art educators have become increasingly convinced that their responsibility extends beyond helping people learn how to make art. Many art educators now feel equally committed to helping people become comfortable and knowledgeable in responding to works of art that others have made. Personal expression and response (Chapman 1978) are now seen as distinct but mutually supportive ways of experiencing art. Both are considered essential concerns of authentic art education, each providing a vital context for the other, together intensifying the learning that is possible in any art lesson.

This interest in expanding the content of art education in North American schools has attracted many art educators to more discipline-based forms of art education. Proponents of discipline-based art education advocate a balanced and sequential curriculum that gives equal time and attention to art production, art history, art criticism, and aesthetics. These four points of focus are meant to encompass the fundamental ways that people participate in the visual arts—that is, they make art, study its evolution, find value in its products, and consider the larger philosophical questions that arise as they encounter art in various ways. This approach to art education is slightly more "academic," with more time devoted to looking at and talking about works of art and, possibly, less time devoted to direct involvement in studio art. The National Art Education Association (NAEA 1986) maintains that children's art education, from its very beginnings, should take up these interwoven strands of artistic experience. Children's activity as artists should be surrounded and informed by the study of art history, the practice of art criticism, and the discussion of aesthetic questions that emerge through experience with art.

Most art educators who focus on the education of young children agree that children's own experience as creators or originators of visual forms should remain the central concern of early childhood art (Chapman 1978; Zurmuehlen 1990). At the same time, most believe that children can and should become acquainted with works of art at a very early age. As Taunton points out, this dual focus on doing and appreciating, making and responding, is not so different from the ways in which we share other art forms with young children: "Just as we teach them our myths, human predicaments, passions, and humor by sharing poems, stories, music, drama, and jokes with them when they are at a young age, so it seems possible and worthwhile for us to expand this interaction to include sharing and exploring the richness of the visual arts as potentially expressive of human import" (1982, 106).

## The National Standards for Visual Arts Education, K–4

The Consortium of National Arts Education Associations recently developed National Standards for Arts Education, defining those things that all children should know and be able to do in the visual arts. These standards list goals and describe competencies that "the art education community, nationwide, believes are essential for every student" (1994, 17–18).

Goals 2000: The Educate America Act places the arts—visual arts, music, dance, and drama—at the core of the American curriculum. The National Standards for the Visual Arts (see box on p. 88), compiled in anticipation of Goals 2000, describe the goals that art educators should strive to attain by various points in children's schooling—roughly, at the end of early childhood (4th grade), the beginning of adolescence (8th grade), and the end of high school (12th grade). Several of these goals transcend typical practices in art education, particularly the traditional emphasis on creative activity that has been the mainstay of early childhood art. In this respect the national standards are clearly intended to influence practice, even to change the ways that art is taught in American schools.

The report outlines "achievement standards" (or performance standards) that specify the understandings and levels of achievement that children are expected to attain by completion of grades 4, 8, and 12 in relation to each of six broad "content standards." A developmental progression implicit in these achievement standards suggests that older children should become increasingly reflective, knowledgeable, independent, and able to deal with abstraction, complexity, and cultural difference. But the report does not incorporate a more specific developmental framework to guide implementation. There is no indication of how a kindergarten curriculum might differ from a second-grade program, for example. Perhaps because the professional arts-education associations responsible for this report tend to concentrate their efforts on art specialists and the elementary and secondary schools in which art teachers are likely to be employed, the report does not in any way address art education in preschools.

In regard to the kind of art learning that should occur in kindergarten through Grade 4, the report states, "Students in the earlier grades should engage in developmentally appropriate learning experiences designed to prepare them to achieve these standards at Grade 4" (Consortium 1994, 21). Reinforcing the best advice of art educators, the report places studio experience

at the center of early art education: "In kindergarten through Grade 4, young children experiment enthusiastically with art materials and investigate the ideas presented to them through visual arts instruction. They exhibit a sense of joy and excitement as they make and share their artwork with others. Creation is at the heart of this instruction" (Consortium 1994, 33).

Both the concepts embedded in this report and the language in which they are presented may be unfamiliar to those classroom teachers of young children who are responsible for teaching art in more than 40% of U.S. elementary schools (NCES 1988) and virtually every preschool. Although art specialists may understand the intent of the standards, many art teachers are unfamiliar with the special developmental characteristics and learning styles of young children. Many teachers who work most directly with young children and their art may find this report difficult to under-

**Standards for Visual Art Education—Grades K through 4***

| *Content Standard* | *Achievement Standard* |
|---|---|
| 1. Understanding and applying media, techniques, and processes | Children<br>a. know the differences between materials, techniques, and processes<br>b. describe how different materials, techniques, and processes cause different effects<br>c. use different media, techniques, and processes to communicate ideas, experiences, and stories<br>d. use art materials and tools in a safe and responsible manner |
| 2. Using knowledge of structures and functions | Children<br>a. know the differences among visual characteristics and purposes of art to convey ideas<br>b. describe how different expressive features and organizational principles cause different responses<br>c. use visual structures and functions of art to communicate ideas |
| 3. Choosing and evaluating a range of subject matter, symbols, and ideas | Children<br>a. explore and understand prospective content for works of art<br>b. select and use subject matter, symbols, and ideas to communicate meaning |
| 4. Understanding the visual arts in relation to history and cultures | Children<br>a. know that the visual arts have both a history and a specific relationship to various cultures<br>b. identify specific works of art as belonging to specific cultures, times, and places<br>c. demonstrate how history, culture, and the visual arts can influence each other in making and studying works of art |
| 5. Reflecting upon and assessing the characteristics and merits of their work and the work of others | Children<br>a. understand that there are various purposes for creating works of visual art<br>b. describe how people's experiences influence the development of specific artworks<br>c. understand that there are different responses to specific artworks |
| 6. Making connections between visual arts and other disciplines | Children<br>a. understand and use similarities and differences between characteristics of the visual arts and other arts disciplines<br>b. identify the connection between the visual arts and other disciplines in the curriculum |

* *Excerpted with permission. The full standards provide additional detail.* (Consortium 1994, 122–27)

stand and to implement, despite the fact that many teachers may already be doing a number of activities the report recommends.

How can these standards be incorporated in the design of curricula that are developmentally appropriate for young children in preschool, kindergarten, and the primary grades? What can we do to ensure that all children will possess the requisite art skills and knowledge by the end of fourth grade? How will we know that children are progressing toward these goals? Finally, we must ask, Are these goals or standards that we can live with? Are they important? Do they fit our ways of thinking about and working with children and art in early childhood classrooms? Do they conform to what we know about young children and the ways they learn? Are they so subject centered or discipline based that little or no room remains in which a child can simply exist and grow and discover those skills and ideas and competencies that provide grounding for further exploration? Do the standards enhance the possibility that art will be taught in serious and substantial ways in early childhood classrooms, or do they imply that the knowledge and skills involved in substantive art education are beyond the expertise or interest of classroom teachers? A closer look at each of these standards and what they might mean for teachers and young children may suggest answers to some of these questions.

### *Understanding and applying media, techniques, and processes*

This first content standard is a familiar concern for early childhood education, closely related to sensory exploration, manipulation of materials and substances, and construction of physical knowledge (Kamii & DeVries 1978; Forman 1994). Many writers and teachers believe that providing appropriate materials and the permission to explore them freely are among the most important responsibilities teachers have in relation to children's experiences with art (Cherry 1972; Tobin, Wu, & Davidson 1989; Edwards & Nabors 1993). Seefeldt suggests that this emphasis on personal exploration is one of the primary reasons why early childhood educators who "view their role as providers of materials and builders of an environment in which children can grow through exploration and experimentation" embrace the developmental theory in art education "which suggests that direct instruction or any interference in personal expression is inappropriate" (1987, 184).

As Kindler (1995) points out, however, it is not enough simply to make materials available. She describes the ways that children in her son's preschool made use of art centers:

> Although opportunities for art materials exploration were plentiful, the children took little advantage of them. On many occasions the art centers remained untouched, and the amount of their use seemed to be closely associated with the teacher's physical presence at the table. Unlike the housekeeping corner or the car racing area, the art centers were rarely approached by children on their own, and even fewer children spent any significant amount of time at them. Most of the "explorations" that I witnessed involved dipping a brush in paint and making one or two marks, before embarking on a more exciting adventure in other areas of the daycare. Only when a parent or teacher stayed with a child and became involved in a dialogue related to actions that the child was performing, did a child seem inclined to truly explore the available materials and tools, or to experiment with their use. (p. 14)

Even when children do take advantage of the materials available in art centers, they may not be engaged in art or even "art-like" (Baker 1994, 93) activity. There is a "crucial difference between making art and merely doing something with materials" (Zurmuehlen 1990, 1). Children's exploratory play with the possibilities offered by paint or clay or wood scraps provides necessary experience with media that they can then use to create objects and images that contain and communicate their ideas and impressions. As Thunder-McGuire emphasizes, "children . . . are composers of meaning rather than merely handlers of art materials" (1994, 51).

Bredekamp and Rosegrant (1992) describe the cycle of learning as beginning in awareness, moving through independent exploration, through more conventional forms of inquiry, toward utilization. This sequence answers many of the questions we face in structuring children's encounters with art materials, processes, and techniques in early childhood education. When children enter school settings for the first time, they are sure to encounter tools, media, and expectations that are unfamiliar. Three-year-olds who have had little or no previous contact with art materials must begin at the most fundamental level of awareness. They must discover, first of all, what can result from the interaction of hand and eye, marker and paper. Whenever a new material or process is introduced, or is reintroduced after a long hiatus, children must return to this level of awareness to refresh their memories of what the substance is and what it can do. Teachers are crucial to this process of becoming aware, whether they simply set out an intriguing combination of tools and materials without comment or demonstrate what can be done with a fistful of clay.

Preschool and kindergarten children are direct in their approaches to art making. Complex processes that force children to keep track of a number of steps interrupt the child's important ongoing dialogues—with herself, with materials, with forms, with teachers, and with peers. More conventional methods of planning images may be introduced in kindergarten and pursued in the primary grades: painting the outline of a scene or a portrait with black tempera paint one day; returning to fill the image with color the next day; and perhaps adding patterns or details the third day. It is particularly helpful to establish the habit of using sketchbooks or scrap paper to make visual studies, work out compositional arrangements, and experiment with media. Children might also produce clay models as three-dimensional "sketches" for papier-mâché sculpture or learn to play with the placement of collage materials before gluing them in place. These preparatory activities are necessary reminders of the deliberation that art requires and vital safeguards against feelings of incompetence and inadequacy that are sure to result when art is presented as a sink-or-swim proposition.

The mastery that allows children to use an art material as a medium for expression grows with experience. Children need time to experiment with materials, to push and prod and examine, to recognize consistent sore points and sterling qualities in each art material that is provided for their use. Frequently, particularly in elementary schools, this process of constructing knowledge is shortchanged in art activities. Children are asked to forego the preliminaries and jump directly to utilization of skills and knowledge that only a privileged few may possess. It is tempting to mistake experiential background for talent under these circumstances, but the truth of the matter may be that children who seem to be most competent in art are those who have had the most opportunities to explore and inquire into art processes, materials, techniques, and ideas at home or in schools. The children who experience less success and more discouragement are apt to be those who missed these initial phases of the learning cycle. Isolated, occasional, sink-or-swim projects will invariably separate the "haves" from the "have nots" in this way.

When art lessons are presented as discrete experiences leading to the rapid production of finished products, most children battle impossible odds. More than once I have watched kindergarten children "learning" to make ceramic pinch pots, with little or no advance preparation to tackle the job. It *was* a job for them, a highly directive procedure followed in assembly-line fashion. Their teachers had no choice but to dictate their every move: "Take this ball; now make a dent with your thumb; now open up a hole; pinch the sides with your fingers—*gently*. Okay, it's done." The soft, lumpy pots disappeared, only to resurface at some later date, inexplicably transformed into hard, lumpy objects. Little or no learning is possible here. Children can do no more than they do when they color within the lines of a ditto master; they simply execute, in a very mechanical way, someone else's project. Kindergarten children can construct beautiful and functional pots, and they need direction in order to do so. But they need extensive experiences with clay before they are ready to utilize a conventional process such as this with understanding or with skill.

The videotape *To Make a Portrait of a Lion* (1987) shows preschool children in Reggio Emilia investigating a lion sculpture in their town square and representing the lion in various symbolic media—sketches, paintings, sculptures, shadow puppets. One of the most impressive things this videotape conveys is the children's absolute certainty about how to proceed with the complicated business of sculpting lions from blocks of clay or capturing their likeness in tempera paint. The children served generously as advisors to one another in the process, suggesting ways to create the texture of a lion's mane or to convey the ferocity of its face in mid-roar. The quality of experience that radiates in the children's work emerged both from their extensive investigation of their subject matter *and* from their mastery of the languages of clay and paint and pencil. The knowledge, skill, and sensitivity they had acquired through repeated encounters with art materials, processes, and techniques allowed them to give form to what they had seen and learned.

### *Using knowledge of structures and functions*

The second content standard may be more difficult to decipher. The Consortium report (1994) uses several fairly ambiguous terms, more or less interchangeably: *structures, functions, purposes, visual characteristics, expressive features,* and *organizational principles.* These terms suggest a dual emphasis: on what works of art are for and on how they are composed or put together. This standard identifies the goals of helping children to recognize how artists use lines, colors, materials, shapes, textures, size, scale, delicacy, and boldness—qualities of visual elements and intonations of visual language—to convey messages or serve specific purposes, as well as enabling children to recognize and, eventually, to achieve such effects deliberately in their own work.

***CHILDREN NEED TIME TO EXPERIMENT WITH MATERIALS, TO PUSH AND PROD AND EXAMINE, TO RECOGNIZE CONSISTENT SORE POINTS AND STERLING QUALITIES IN EACH ART MATERIAL THAT IS PROVIDED FOR THEIR USE.***

Young children may recognize the qualities of line or nuances of expression in the works of other artists long before they are prepared to consciously attend to such issues in their own work (Gardner 1980; Leeds 1986). Very young children read and interpret visual symbols more fluently and more frequently than we might initially suspect. The achievement standard that states that by the end of fourth grade, children should be able to "describe how different expressive features and organizational principles cause different responses" (Consortium 1994, 123) may be overly ambitious. But it is certainly possible to invite children to share their impressions of works of art and to provide opportunities to explore forms and functions of objects and images.

Young children's responses to works of art take many forms. "A finger slowly tracing a shape or pointing out a detail, a nod, a shrug, a random observation, the incorporation of a theme into constructive or dramatic play: all are significant aesthetic responses" (Thompson 1994, 15). It is important that teachers recognize and respect the many ways in which children understand and respond to artworks.

Children reveal their theories of art and beauty in many ways: in the objects they collect, the colors they choose when they paint, the judgment that tells them when a painting is finished or when it needs one more small patch of blue, right there. Aesthetic questions crop up as children work. What can sculptures be made of? Is the fire alarm a sculpture? In casual conversations around drawing tables, opinions about art are offered and debated. What is the difference between a drawing and photograph? What is the proper way to draw a Power Ranger? Does my drawing have to look like someone else's? Speaking among themselves, children may be content simply to say their piece and move quickly along to other topics. Teachers may help to sustain dialogues merely by entering into these discussions. Children's questions about art may be recorded, saved for discussion at a more convenient time, or used (by 7- or 8-year-olds) as the basis of research projects, such as opinion surveys or interviews.

We validate aesthetic encounters when we encourage children's sensory explorations and listen attentively to their descriptions of objects they have seen, touched, smelled, heard, and tasted. When we help children to recognize what it is they like so well about the illustrations in their favorite picture books, why other children prefer different images, or why a painting they once loved now strikes them as "weird," we extend this natural inclination to find some forms or images attractive and others unappealing or downright ugly.

Critical activities focus on close examination of art objects, such as paintings or weavings or drinking vessels. Aesthetic dialogues allow children to explore the nebula of issues that surround participation in artistic activity: what art is or is not; who makes art and why; how buildings and banners and baskets express what is important to individuals and cultures. Both critical activities and aesthetic dialogues are ways of talking about art. Both emerge naturally from children's engagements with the creation of visual forms. Aesthetic and critical activities in early childhood classrooms encourage children to gather visual information to support their judgments, to organize and articulate their thoughts, and to explore the commonalities that exist between their own work and work created by other artists.

Professional art critics perform several operations designed to help their readers or listeners peel away the layers of meaning wrapped around any work of art (Feldman 1972; Cole & Schaefer 1990). They describe the work as fully as possible. They might discuss the subject matter of the painting, the quality of lines, the surfaces of paint, the textural qualities of a print, or the scale of a photograph. They enumerate the visual attributes of the work, much as we might describe an off-the-beaten-path resort setting to those who stayed at home. Critics analyze relationships within a work of art: how the picture is composed or put together; how a line or color or shape is repeated or placed to draw the viewer's attention to the central focus of the work. Critics also suggest what the work might mean, how it might be interpreted by others who encounter it later, or what it seems to say about a certain aspect of human experience. Finally, critics may offer some assessment of the merits of a particular work—its quality, value, purpose, or human import.

The process of analysis may be the most difficult for children to grasp, but even this phase of the critical process is not completely beyond their ken. Preschool and kindergarten children readily identify the part of a painting that first catches their attention when they whirl around and take the painting by surprise. They also point out objects in a work that seem closer or farther away, those that are light or dark, those that are bright or dull. One of the most productive critical

activities in early childhood is description. The simple act of making a complete inventory of an image slows and centers the act of seeing. Adults who visit art museums spend an average of 15 seconds, and seldom more than 2 minutes, standing before a single work (Newsom & Silver 1978, 81), barely enough time to register the fact that there is a large, brightly colored rectangle hanging on the wall. Children must learn to approach works of art in a less hurried way if they are to remain confident that these artifacts are user-friendly. As Herberholz and Hanson (1995) suggest, coming to know a work of art is very much like making a new friend, a process that requires an investment of time and effort and a certain amount of patience.

### *Choosing and evaluating a range of subject matter, symbols, and ideas*

The third content standard deals with the impulse that is central to children's art making, the creation of meaning in visual form. Lark-Horovitz explains, "Art is a vital tributary that feeds and enriches the great flow of a child's development" (1976, 164). As a language through which children explore and express their understanding of the world and their experience in it, art can be the binding force and primary medium of early childhood education. The preschools of Reggio Emilia provide the most fully documented contemporary example of this principle at work.

Chapman (1978) suggests that as children make art, they should learn different ways to generate ideas for visual expression, to refine and modify those ideas, and to use art media to communicate their intentions. Teachers provide assistance by introducing children to each of these phases of the artistic process and helping them to discover ways of selecting, defining, and executing their ideas. Among the most crucial forms of assistance that teachers provide to young children is the preliminary questioning or listing of alternatives that art educators call "motivational dialogue" (Lowenfeld 1957; Herberholz & Hanson 1995). Children eventually internalize this process of thinking through possibilities for visual representation of their ideas (Vygotsky 1962). But teachers provide significant models to children when they engage in this preliminary play with ideas.

Many preschool children are just becoming aware of the possibility that their drawings might express ideas other than those "visual concepts" (Burton 1980, 61) that preoccupy the scribbling child. The capacity to create representational symbols emerges slowly between the ages of 3 and 5. Children are busy on several fronts simultaneously. The increasing control and coordination of hand and eye that comes with years of scribbling experience is demonstrated in the ability to outline forms that previously appeared swathed in multiple lines (Kellogg 1970). These shapes are combined in many ways as children experiment with relationships of proximity and enclosure. Triangles placed atop squares, small circles clustered within large, projecting lines placed along circumferences become houses, humans, trees, and suns. At the same time, children begin to talk about their drawings. Names are first attached to completed scribbles, but naming soon appears early in the drawing process, when speech takes on a directing and planning function (Vygotsky 1962). Eventually children announce what they intend to draw before they begin and thereby commit themselves to a course of action and to the necessity of discovering means to that end (Chapman 1978).

Preschool children's growing awareness of the bond between art and ideas requires recognition and response from teachers and peers. The process of discovery is nurtured by conversations that allow children to complete their drawings verbally (Golomb 1974) and to share the stories that are only partially captured in visual forms (Hubbard 1985; Dyson 1986; Thompson 1990; Thompson & Bales 1991). Preschool children also need experiences that encourage flexibility in the use of art media and leave the choice—to represent or not to represent—open to each child (Burton 1980; Smith 1983).

By the age of 5, most children are accomplished and comfortable with representation and use their drawings to construct visual anecdotes or to enact dramatic scenarios. Kindergarten children, still exploring the realm of imagery and figuring out where its boundaries lie, need daily opportunities to draw. Sketchbooks, similar or identical to those used in early writing experiences, provide a repository for children's most significant images (Thompson 1995). Children's self-initiated and self-directed drawings testify to passing preoccupations and enduring interests. Events in children's lives—within and beyond school—surface to be explored and more fully understood as they are organized and embellished visually (Wilson & Wilson 1982; Coles 1992). The challenges children set for themselves when they draw without direction from adults are often more meaningful and more productive than any problem we grownups might think to pose. In their "free or voluntary" (Lark-Horovitz, Lewis, & Luca 1973, 35) work, children create "zones of proximal development" (Vygotsky 1978), much as children do when they play, marking off areas of exploration that lie just beyond familiar territory.

As children reach kindergarten and elementary grades, they need additional support to retain the freshness and the fluency of their imagery and to maintain their confidence in their ability to create visual forms. Children who draw humans on a fairly regular basis may be asked to draw their families or self-portraits or re-creations of a recent event. Kindergarten children might interpret imaginative themes, as well, recording their visions of distant lands and places or creatures and inventions that exist only in their minds. Young children may begin to conduct visual inquiries as they visit grocery stores or gardens or factories, sketching or observing closely, on location, before returning to the classroom to utilize this information in a drawing or painting or construction. Motivations that focus on personal events and concrete experiences expand children's graphic vocabularies and drawing skills (Wilson & Wilson 1982). Eight-year-old children may be most adept at isolating perceptual information from a still life or a scene and knowing how to translate that information into the language of drawing. But much younger children also produce significantly richer drawings when their minds are amply furnished with memories and observations.

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Young children tend to refine and modify their ideas for visual expression by creating series of works on a single theme (Thunder-McGuire 1994). Toddlers who demand page after page of paper within a 15-minute drawing session are practicing and refining their scribbles in a very purposeful way (Gardner 1980). Five-year-olds who fill sketchbooks with Teenage Mutant Ninja Turtles—together, alone, in action, at rest, with weapons, with pizza—are also honing important skills. Exploration and inquiry are extended processes for young children, as they are for artists of all ages. New challenges and unforeseen directions emerge constantly as what children have done suggests what they might do next.

### *Understanding the visual arts in relation to history and cultures*

The fourth content standard brings us back to look at works of art from a slightly different perspective. The idea that young children might benefit from the study of art history or from discussions of the art forms that are made and valued by various cultural groups remains controversial after years of debate in art education (Erickson 1995). Is this relevant or developmentally appropriate content for early childhood art?

Certainly, facts, dates, and chronologies are neither important nor understandable to young children. What matters most is that they know that people have always created art forms to document, celebrate, ponder, and enrich their lives. The objects and images that survive tell us about people who lived in other times and places—how they looked, what they wore, where they lived, what they did, and what they cared about. The fundamental resemblances among members of the human family and the distinctive systems of belief that bind a culture are concretely presented in works of art. Children's own activity as artists and beholders is validated and taken seriously when they are encouraged to recognize their participation in a tradition as old as human history, as diverse as the billions of people who have contributed to it.

Children's understanding of their artistic heritage begins in preschool with the awareness that artists are

people who live, or once did, in places that can be found on the classroom globe or a local street map. Children should come to know artists as people who value some experiences in their lives so deeply that they make them the subject of their art, a gift to others. Monet in his garden, Louise Nevelson scrounging the streets of New York in search of castoff lumber, Joseph Cornell saving scraps and clippings and beautiful junk to enshrine in boxes—these are kindred spirits. Children may find possibilities for their own work in the work of these other artists (Zurmuehlen 1990). In the sheer variety of ways in which artists have chosen to present similar themes, children learn that visual expression bears the mark of its creator, the stamp of one unique and incomparable perspective on the world.

Children depend on adults to alert them to things that occurred before they were born. They need to know what happened in previous chapters of human history if they are to understand the situations in which they find themselves. Just as family history is revealed—gradually and selectively—to children, so may we share the anecdotes and snapshots, the mementos and practices that ground our communal past and give rise to its traditions. Just as we introduce children to grandparents, aunts, uncles, and cousins, telling stories to characterize each, so may we introduce them to other, more distant relatives who have contributed to the legacies we share. Among the members of this extended family are artists, people who create things as simple as coffee cups and as grand as cathedrals, whose works surround us and make our lives special. If we fail to expose children to these people and their stories, children may come to regard artists as *different,* as strangers who operate outside the ordinary world.

A light-hearted, natural process of becoming acquainted with artists begins when young children become aware that the pictures in their favorite books, the sculpture in the park, and the woven hanging in the living room were made by artists. This awareness grows as children encounter more people who are artists, more objects that are art, more places and situations where art is made, displayed, and enjoyed. Eventually children begin to explore the similarities among these multiple cases, to devise personal aesthetic theories and definitions. This process continues throughout life, fueled by information collected from many sources, informed and challenged by countless observations. But the process begins, with our sanction and support, in earliest childhood.

By kindergarten or the early years of elementary school, children may begin to conduct more formal inquiries into the nature of art, developing notions that begin to approximate cultural definitions more closely. Examining works closely in a search for details, 6- and 7-year-old children demonstrate facility in the perception of qualities as obvious as the dour determination of the central figures in Grant Wood's *American Gothic* and as subtle as the lace curtains hanging in the windows of their farmhouse. Children can begin to interpret works of art from the artist's point of view, as well as their own, speculating on the artist's intentions and the meaning that he or she wanted the work to carry to other viewers. They can measure an artist's success against their own response and compare informed opinions with other children. This knowledge can be used in many ways. An artist's themes may be borrowed temporarily for a child's own purposes. A classroom gallery may be constructed, featuring works by artists selected by the children and commentaries and gallery notes that the children may write or dictate.

We know much less about the growth of young children's understanding of art objects (Taunton 1982) than we do about their development as artists, although our understanding increases daily (Kerlavage 1995; Schiller 1995). It is difficult to suggest guidelines to determine what children should know or be able to do at a given age. The cycle of learning may unfold quickly in some cases, slowly in others, depending, in part, on the breadth of the issue that stimulates children's awareness. Kindergarten children may learn a great deal about a single artist and about their own preferences for visual forms in a week of relatively focused learning. But some of their questions will not be fully answered for years to come. Who can say, after all, just what a sculpture might be?

### *Reflecting upon and assessing the characteristics and merits of their own work and the work of others*

The fifth content standard acknowledges an important, but frequently neglected, part of the artistic process. As Feldman points out, "Very often . . . the difference between the great and the mediocre artist is due to the fact that the great one is a great critic—not necessarily of other people's work, but of his [or her] own" (1972, 54). This ability is particularly crucial for older children who tend—in this culture, at least—to become discouraged by the discrepancy between what they intend to draw and what actually appears on the page. But the habit of reflecting on one's own work originates much earlier. In fact, this behavior may be most evident, and most open to adult participa-

***A LIGHT-HEARTED, NATURAL PROCESS OF BECOMING ACQUAINTED WITH ARTISTS BEGINS WHEN YOUNG CHILDREN BECOME AWARE THAT THE PICTURES IN THEIR FAVORITE BOOKS, THE SCULPTURE IN THE PARK, AND THE WOVEN HANGING IN THE LIVING ROOM WERE MADE BY ARTISTS.***

tion, among preschool and kindergarten children, who tend to accompany their drawings with running commentaries and conversations (Thompson & Bales 1991).

Preschoolers may seem to be relatively uncritical of their drawings. At the same time, they are often ready and willing to critique the work of other children when their drawings fail to communicate their meaning clearly to a viewer (Korzenik 1973–74, 1976). It is clear, too, that young children actively seek adult attention and response to their drawings, paintings, and constructions. Most preschool children are eager to explain what they have done and why. They enjoy elaborating on the stories contained in their pictures and providing titles for their work. These captions and titles, recorded and displayed with the child's work, provide information about the child's interests and intentions that can be very helpful to parents and children alike.

Between the ages of 3 and 8, children learn to monitor and direct their own actions. As Tudge and Rogoff (1989) suggest, teachers facilitate this process by helping children to plan and remember deliberately. Art experiences present plentiful opportunities to encourage children to discuss their plans and ideas, to recall what they have done, and to consider the concrete results of the actions they have taken and the decisions they have made. It is important that teachers receive children's work with something more substantial and personal than a shopworn compliment and directions for storage. A moment spent reflecting together about what the child attempted or accomplished, a simple descriptive statement offered by the teacher, or a small ceremony to mark the completion of a work of art is more satisfying—and far more educational—for the child.

### *Making connections between visual arts and other disciplines in the curriculum*

This final content standard recognizes the interrelationship between subject-matter areas and the value of learning that crosses these traditional boundaries. Following a pattern established by the NAEA (1986), the national standards emphasize what is most unique to learning in the visual arts and propose "that the arts should be taught for their intrinsic value" (Consortium 1994, 13).

It is true that possibilities for integrating the visual arts with other areas of the early childhood curriculum are virtually infinite. Explorations of art media and sensory phenomena involve processes identical to those that children use in constructing scientific knowledge (Hawkins 1974; Kamii & DeVries 1978). The close relationship between art and language in the early years provides unlimited opportunities for collaborative ventures in visual and verbal storytelling (Graves 1984; Hubbard 1985; Dyson 1986; Olson 1992). As children begin to learn the "rules" of representation that govern and distinguish modes of expression (Korzenik 1973–74, 1976), these early writing and drawing experiences provide substantial ground for reflection. The content of art embraces the full range of human experience. In a fundamental sense, children's art is *about* what they are learning, in and out of school. Drawing may be a way of conducting research, and artworks of many kinds may serve to culminate and consolidate the learning that occurs in thematic and multidisciplinary projects, as the children of Reggio Emilia so clearly demonstrate.

Although art educators recognize and value these connections, they tend to become a bit wary when the subject of integration arises. Artistic learning is too often lost or deformed in the shuffle, reduced to the practice of fine motor skills or the production of stereotyped images and patterned projects. Extreme care must be taken not to subvert learning in one area of the curriculum in the interests of another. Full working partnerships between subjects are possible and highly desirable, but they must be formed and maintained with the best interests of each party in mind. As the *National Standards* document acknowledges, forging connections across disciplines is "one of the things the arts do best" (Consortium 1994, 13). At the same time, the document urges that the integrity of the art disciplines must be maintained whenever correlation or integration occurs.

For example, first- or second-grade children who are studying dinosaurs learn far more by drawing their own versions of prehistoric creatures than they possibly could by coloring in a mimeographed outline of a triceratops. Further, teachers learn far more about the depth and extent of children's understanding when children are actively representing their knowledge of dinosaurs. Because what we know about dinosaurs' appearance comes to us through artists' renderings, based on collaboration with scientists, this topic provides an

ideal focus for interdisciplinary projects: the construction of prehistoric environments and papier-mâché or clay models, built—as are all artists' conceptions of dinosaurs—upon skeletal structures discovered by researchers, costumes, plays, artists' books, murals, or illustrated journals. Endless possibilities exist for this and other themes to be explored through the multiple perspectives that various subject areas provide.

## Have we taught "those little guys" anything? Evaluating art learning

When young children make art on a regular and frequent basis, the tangible records of their progress accumulate at an astounding rate. A sampling of each child's work, dated and annotated, reveals the changes in their control of media and ideas and visual complexity that occur with time and experience. A single drawing may testify to an important developmental or conceptual breakthrough—a 4-year-old's first representation of a person or an 8-year-old's first horizon line. These are occasions to celebrate and share with parents. A more complete perspective on the child's growth may be provided by periodic reviews of sketchbook drawings or a portfolio that documents the child's work in different media. The changes that occur in young children's art are often imperceptible, day to day, but dramatic when viewed in retrospect. Drawings may provide particularly useful information not only in regard to the evolution of a child's interests over a period of time but also in the growth that is reflected in the way the child organizes space and depicts humans—the favorite subject of the young artist. These structural characteristics may be compared to visual taxonomies of child art available in many books on art education and the psychology of children's art (see, for example, Lowenfeld 1957; Kellogg 1970; Golomb 1974, 1992; Chapman 1978; Brittain 1979; Wilson & Wilson 1982; Cox 1992).

In a similar way, children can tape record or jot down their responses to works of art displayed in the classroom. Provocative observations, insights, questions, and curiosities the children express can be displayed beside the works of art that inspired them in a classroom gallery (Thompson 1994).

The products of a child's activity are important sources of information for teachers, particularly when they are supplemented by observations of the child at work. Because young children are "symbol weavers," as Dyson (1986, 381) suggests, there is often much more to their drawings than meets the eye. Preschool children practice a kind of performance art (Thompson & Bales 1991), talking, gesturing, humming, and whirring as they draw, filling in and fleshing out their images with many kinds of additional (and ephemeral) information. This practice may continue until the age of 7 or so (Korzenik 1973–74), when classroom conventions and the emergence of "inner speech" (Vygotsky 1962) conspire to render drawing a more silent and self-contained process. For younger children, drawing is an event. To fully understand the artifacts that this event produces, we have to be there as the event unfolds.

There are many ways to document the process of art making. Teachers who are available to take dictation as 3-year-olds label scribbles or as 5-year-olds compose texts to accompany their drawings enjoy privileged access to children's intentions and ideas. Occasional observation of a child working at an easel or composing a drawing provides invaluable information about the sequence of decisions a child makes and the difficulties he or she encounters. Even 7- or 8-year-old children may lapse into egocentric or private speech (Vygotsky 1962) when they confront a problem that requires thoughtful resolution. These are moments in which a teacher's response may be most helpful in supporting and sustaining emergent reflection. It is extremely useful to record, however briefly, things that children say and do when they engage in art activities. Not only do we gather very basic information about children's preferences for one activity over others but we may begin to notice subtle signs of growth that can be communicated to parents and to the children themselves.

Perhaps the most important sign of a young artist's progress, however, is the intensity of the child's involvement in art activities, his or her capacity to spend ever-longer periods of time engaged in evermore ambitious projects and pursuits. The cycle of artistic learning that embraces the many small experiences children have day to day begins, in earliest childhood, with the awareness that it is possible to explore the world in many ways, to conduct inquiries that rely very little on words or numbers, and to utilize the understanding that results in ways that make life more colorful and memorable and worthwhile.

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# 8

# Transforming Curriculum in Music

*Barbara Andress*

*An infant is cradled in mother's arms as she rocks and sings "Twinkle, Twinkle, Little Star." The baby coos, gurgles, babbles, and otherwise enjoys the rhythmic and melodic play. A 2- or 3-year-old plays with a tray containing specially prepared jingle-bell stars. He stacks, shakes, arranges patterns, swishes stars high and low while singing his own version of the song: "Dis star ringy dingy . . . gonna fly in the sky . . . twinky dis way . . . yeh! yeh! yeh!" The child grows in ability to more accurately sing the song, first singing only the anticipated global properties, such as the "twinkle, twinkle," as the adult performs the entire song. Older 4-, 5-, and 6-year-olds are capable of accurately performing the song and can arrange star forms to make an up-and-down picture of the melody (low, low, high, high, higher, higher, low . . . ). Their fingers point to the sequence of stars as they sing the song. Seven- and 8-year-olds vacillate between using iconic representations (pictures of sounds, such as the star) and traditional music notation when playing with the song.*

The acquisition of song and melodic understanding moves developmentally through the years, cycling from inactive hands-on experiences, to meaningful pictorial representations, and finally to the use of abstract, mutually agreed-upon representations of sound ideas. This three-phase cycle is repeated, with various degrees of emphasis and time lines, as each new learning is encountered by students of all ages. The appropriateness of the learning process and content is predicated on the developmental level of the child; therefore, planning must be first child-centered, then content-relevant.

This chapter describes developmentally appropriate music experiences for children, from birth through age 8, building on the framework of national music education standards established by the Music Educators National Conference (MENC 1994a, 1994b). Examples of typical behaviors are cited to demonstrate how children at each stage of development may be expected to perform, create, listen to, describe, and value music as they sing, move, play instruments, read music, and write music.

Whether one is preparing programs for very young or older learners, the goal of music education is to nurture a disposition for music. Propensity, curiosity, and involvement in music then become a significant force throughout the child's life. Such a disposition results from many interactions with the beauty and expressive nature of the media and the acquisition of skills and basic understandings—music literacy—that allow the child to more independently control his or her own use of music.

## Music curriculum guidelines

> The years before children enter kindergarten are critical for musical development. Young children need a rich musical environment in which to grow. (MENC 1994b)

As part of the larger movement to establish educational content standards for the various disciplines, MENC developed *Opportunity-to-Learn Standards for Music Instruction: Grades PreK–12* (1994a) and *The School Music Program: A New Vision* (1994b). These documents provide criteria for valid music program content for children from birth through 8 years old. The Opportunity-to-Learn Standards also define the nature of the materials and equipment, staffing, and other conditions necessary for achieving the curriculum standards.

### Glossary of Music Terms

**dynamics**—gradations of volume throughout a musical work
**elements of music**—pitch, rhythm, harmony, dynamics, timbre, texture, form
**form**—overall structural organization of the composition
**genre**—a style or category of music, such as gospel, rock, or march
**harmony**—combination of tones sounded simultaneously
**meter**—grouping of beats determined by underlying accents
**meter signature**—a fraction found at the beginning of each piece or therein, the upper number indicating the number of counts in each measure, the lower number the note that lasts one count
**ostinato**—a short, persistently repeated melodic or rhythmic pattern
**pitch**—highness or lowness of musical sound
**rhythm**—groupings of long and short musical sounds
**staff**—five narrow, spaced horizontal lines on which music is written
**style**—the distinctive manner in which the elements of music are organized, reflecting their use throughout various times and places (e.g., baroque or gospel)
**tempo**—relative rate of speed
**timbre**—quality of tones distinguishing one instrument from another
**texture**—density of musical sound, such as "airy" or "thick"
**tonality**—tones as they relate to a harmonic center or point of rest

This chapter builds from and elaborates on the standards of the professional organization of music educators, specifically addressing the issue of age-appropriate and individually appropriate music content.

## A child-centered curriculum

Curriculum models organize and clarify the content and action that teachers and children undertake. The adult must deal with how children learn, decide how to package the learning so that it is developmentally appropriate, and determine when to introduce specific learnings. A child-centered curriculum is based on the assumption that the learner is more important than that which is to be learned. The child is more important than the music; music has the power, however, to make the child's life more important. The planner of music curriculum must have a basic understanding of the child's cognitive, physical, and socioemotional development and be familiar with resources for music-education expertise.

The following statements describe a child-centered approach to the music curriculum (MENC 1994b, 9).

1. All children have musical potential.
2. Children bring their own unique interests and abilities to the music learning environment.
3. Very young children are capable of developing critical thinking skills through musical ideas.
4. Children come to early childhood music experiences from diverse backgrounds.
5. Children should experience exemplary musical sounds, activities, and materials.
6. Children should not be encumbered with the need to meet performance goals.
7. Children's play is their work.
8. Children learn best in pleasant physical and social environments.
9. Diverse learning environments are needed to serve the developmental needs of many individual children.
10. Children need effective adult models.

## Music learning environment in early childhood

Appropriate musical content can best be explored in an interactive environment that is rich in manipulative objects, instruments, quality musical examples, and adults effectively modeling music. Music learning experiences for young children should occur through-

out the day and the curriculum, as well as in special-interest areas and guided group play (Andress 1991).

### *Music across the curriculum*

Music should permeate the child's daily experiences. Opportunities for spontaneous music making and planned music within other daily curricular activities enhance the child's learning. Because young children approach learning holistically, the common practice of limiting music experiences to grouptime is not advisable. Music experiences can be derived from topical studies, such as nutrition, nature, or transportation. For example,

*The topic in Ms. Barker's preschool is nutrition. The children play a musical game of going to the store to buy fruit. Ms. Barker provides circle stickers, butcher paper, and several picture cards of fruit. She works together with the children to construct a play mat that has eight stickers defining the path to the market. They draw a square box at the end of the path, called "The Market," in which the cards depicting fruit are placed. The children play the game by using their fingers to rhythmically tap each dot on the path while chanting, "To* ***market,*** *to* ***market,*** *to* ***buy*** *some good* ***fruit. Home*** *again,* ***home*** *again,* ***rooty-toot-toot!*** *" (The children might chant additional verses about their choice of fruit, how good it will taste, etc.) The children make repeated trips to the market or create new paths to new markets.*

Music experiences can also be related to concept development, such as when clarifying the many ideas represented by the words *fast* and *slow* (for example, people and things can move fast and slow; musical sounds move relatively faster or slower [tempo]).

### *Special-interest areas: Choice time*

Opportunities to individually explore music sounds and ideas in special-interest play areas are a part of the daily classroom environment. Just as children make choices for puzzles, paints, or clay, they also need the option to play with specially prepared manipulative music materials and instruments. Manipulative materials may consist of a play mat and figures that motivate singing an improvised "opera" about "Old King Cole" or a traditional song, such as "Teddy Bear . . . Turn Around."

Individualized play settings afford each child an opportunity to bring his or her own unique interests and abilities to the activity. The same play setting can be appropriate for all children, including the learner who is gifted and talented or has other special learning needs.

***OPPORTUNITIES FOR SPONTANEOUS MUSIC MAKING AND PLANNED MUSIC WITHIN OTHER DAILY CURRICULAR ACTIVITIES ENHANCE THE CHILD'S LEARNING.***

*A music play environment is set for 4-year-olds. A xylophone with removable bars is placed in the environment, along with pictures of children dancing in a circle. The xylophone pitches are C-D-E-G-A-c′ (pentatonic scale). All of the children seem to enjoy exploring sounds of the instrument and singing their version of "Ring Around the Rosie." The children interact in the same environment at their own individual level of interest and development. Brian, standing across the room, notices other children playing with the xylophone but does not approach the music play area. Jamie plays by removing each bar and tediously replacing it on the sound box; occasionally he plinks a sound with the mallet. Teresa randomly taps on the bars while singing the song. She has naturally begun singing on an in-tune pitch, so the accompaniment is very pleasing to the ear. She completes the play by abruptly laying down the mallet and announcing, "That's the end!" Precocious Robbie sorts and arranges the bars from lowest to highest sound, then proceeds to use trial and error to tap out the first phrase of the melody: (G-G-E-A G E). Although pleased with his effort, he tires and leaves the area.*

As is clear from this example, the early childhood music curriculum that is planned for the daily inclusion of a special music play area provides for individual developmental differences, as well as focusing interest.

### *Guided group music play*

The third part of the early childhood music learning environment is guided group music play. This is the traditional approach often referred to as the "circle-time" activity. Children work together in a more formal, cooperative setting. During grouptime they become aware that people make music together, hear and perform songs and music of the culture, move expressively and rhythmically to music, play instruments, and, when developmentally appropriate, are introduced to "pictures of sounds" (icons).

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The three-part approach to the early childhood music learning environment should also be applied to children in the primary grades, because 6- through 8-year-olds continue to need opportunities for exploratory as well as guided music play. The responsibility for this age group's music learning becomes a collaborative approach among classroom teachers and music specialists.

## Young children's musical behaviors

Three- and 4-year-old children will perform, create, listen, and describe music. They will demonstrate their ability to do this by singing, expressively moving, playing instruments, and responding to pictures of musical ideas. The following are descriptions and comments regarding the child's observable behaviors during the performance of music.

### *Singing*

Young children sing in two ways: their own improvised vocal play and structured songs of the culture. The child's own improvised songs typically involve voice inflection tunes that have little regard for music rules. Such tunes tend to musically ramble, demonstrate disregard for logical lyrics, and often mix children's own ideas with fragments of traditional song: "I gonna drive dis car and gonna go to the store and buy carrot and Jesus loves me this I know." The developmental sequence as the young child grows in ability to sing alone or in a group involves (1) engaging in voice inflection play, (2) singing her or his own rambling tunes, (3) listening to traditional songs of the culture, (4) singing global properties (most obvious words/melodic patterns) of traditional songs, and (5) displaying increased skill in performing lyrics with rhythmic and melodic accuracy.

### *Movement*

The young child's movement is an important musical response because it is nonverbal and allows the observer to better understand what aspects of the music the child is sensing. Early movement activities center on the body (body touch, finger play, song games) and responses to the wholeness of the music heard. The child begins to refine gestures to perform and describe introductory-level music information as heard in timbre, expressive controls, rhythm, melody, and form.

### *Playing musical instruments*

Young children show keen interest and curiosity as they explore the sight and sound of musical instruments. A child may repeatedly ring a bell to savor the

delightful sound. Discovering that sounds can be the same, similar, or quite different provides opportunities for auditory discrimination and cognitive problem solving. Instruments can be used in the learning environment to explore shape, size, and sound relationship; organize, order, and classify sounds; use sounds to express musical ideas (a loud and soft composition created with a woodblock) and nonmusical ideas (the woodblock sound of galloping ponies); or, when developmentally appropriate, play simple accompaniments for songs and perform rhythmic and melodic ideas.

Playing instruments with rhythmic and melodic accuracy is a developing skill; therefore, it is inappropriate to press young children to attain this goal. Harmonic sounds, however, can be attained even at the exploratory level, for example, when an adult uses xylophones with removable bars or children use string instruments that have been specially tuned to control pitch choices. Older 4-year-olds begin to demonstrate the ability to perform simple rhythmic accompaniments and melodic ideas as a part of their music making.

The planner of an effective music curriculum assumes that the teacher has available an assortment of small percussion instruments (including instruments such as xylophones) for use by children. A teacher cannot simply tell children about musical sounds; they must be experienced.

### *Reading and writing music*

Two- to 4-year-old children are at a concrete level of learning; therefore, abstract symbols, such as traditional music notation, are meaningless when presented at this stage of development. Games in which children are encouraged to jump on staff lines and pretend to be musical notes are not understood by this age group and should be considered inappropriate practice.

The older 4-year-old child can be introduced successfully to pointing or tapping pages that depict musical ideas using "pictures of sounds" (icons). Such pictures are usually topical and may represent the underlying steady beat while chanting or singing. For example, children play with a tapping page that depicts 12 boats containing happy sailors, followed by 4 boats with happily sleeping sailors. The children tap each picture in the sequence, including the silent beats, while singing,

**Row, row, row** your **boat,**

**gent-ly down** the **stream (silent beat).**

**Mer-**rily, **mer-**rily, **mer-**rily, **mer-**rily,

**life** is **but** a **dream (silent beat).**

***THE YOUNG CHILD'S MOVEMENT IS AN IMPORTANT MUSICAL RESPONSE BECAUSE IT IS NONVERBAL AND ALLOWS THE OBSERVER TO BETTER UNDERSTAND WHAT ASPECTS OF THE MUSIC THE CHILD IS SENSING.***

## Appropriate music curriculum for children birth through age 4

The Music Educators National Conference offers guidance for music experiences at the various stages of the young child's development (MENC 1994b).

### *Music experiences for infants and toddlers*

Children have music experiences from the very beginning of life.

> Infants and very young children experience music by hearing it, by feeling it, and by experimenting with pitch and timbre to their vocalizations. Children should experience music daily while receiving caring, physical contact. Adults can encourage the music development of infants by
>
> 1. singing and chanting to them, using songs and rhymes representing a variety of meters and tonalities;
> 2. imitating the sounds infants make;
> 3. exposing them to a wide variety of vocal, body, instrumental, and environmental sounds;
> 4. providing exposure to selected live and recorded music;
> 5. rocking, patting, touching, and moving with the children to the beat, rhythm patterns, and melodic direction of music they hear;
> 6. providing safe toys that make musical sounds the children can control; and
> 7. talking about music and its relationship to expression and feeling. (MENC 1994b, 10)

### *Music experiences for 2-, 3-, and 4-year-old children*

The Music Educators National Conference also offers the following guidance for music experiences for children ages 2 through 4 (see box on p. 104).

**Music Education Standards for 2-, 3-, and 4-Year-Olds***

| *Content Standard* | *Achievement Standard* |
|---|---|
| 1. Singing and playing instruments | Children<br>**a.** use their voices expressively as they speak, chant, and sing;<br>**b.** sing a variety of simple songs in various keys, meters, and genres (folk songs, ethnic songs, singing games), alone and with a group, becoming increasingly accurate in rhythm and pitch;<br>**c.** experiment with a variety of instruments and other sound sources; and<br>**d.** play simple melodies and accompaniments on instruments. |
| 2. Creating music | Children<br>**a.** improvise songs to accompany their play activities;<br>**b.** improvise instrumental accompaniments to songs, recorded selections, stories, and poems;<br>**c.** create short pieces of music, using voices, instruments, and other sound sources; and<br>**d.** invent and use original graphic or symbolic systems to represent vocal and instrumental sounds and musical ideas. |
| 3. Responding to music | Children<br>**a.** identify the sources of a wide variety of sounds, such as crying baby, piano, guitar, car horn, and bursting balloon;<br>**b.** respond through movement to music of various tempos, meters, dynamics, modes, genres, and styles to express what they hear and feel in the works of music; and<br>**c.** participate freely in music activities. |
| 4. Understanding music | Children<br>**a.** use their own vocabulary and standard music vocabulary to describe voices, instruments, music notation, and music of various genres, styles, and periods from diverse cultures;<br>**b.** sing, play instruments, move, or verbalize to demonstrate awareness of the elements of music and changes in their usage; and<br>**c.** demonstrate an awareness of music as a part of daily life. |

(MENC 1994b, 10–12)

* *Excerpted with permission. The full standards provide additional detail.*

## Appropriate music curriculum for children ages 5 through 8

Music programs for school-age children, kindergarten through the primary grades, have a long history dating back to the eras of singing schools, in which one of the primary uses of music was to make teaching or reading more palatable. Music text series have been available as resources for teachers for many years. These series have grown in sophistication of content, sequence of information, and quality of age-appropriate musical examples and activities. Text resources now involve pupil books, teacher's guides, large chart books, quality recordings, and assorted supplemental materials. The series provide teachers with a comprehensive model of time-tested "do-able" experiences for children at each grade level (see the bibliography at the end of this chapter for examples). Attention must be paid to issues such as songs in an appropriate vocal range, logical sequence for introducing musical understandings, and effective guided listening and movement experiences. Teachers should refer to text series as a model and then personalize the materials and approaches to meet the unique needs of children's and their own abilities to communicate musical ideas.

Five- through 8-year-old children are becoming socially conscious and can be involved in many cooperative music play experiences. These years are crucial for children to develop a concept of music, gain fundamental skills, acquire sensitivity to musical sounds and their beauty, and use music as an expressive art. Appropriate music-making experiences include group activities such as singing, playing classroom instruments, moving expressively and with precise responses to ideas heard in the music, listening to music of many cultures and of many eras, and beginning to acquire skills in reading and writing music. The approach to guiding children's musical literacy continues to be based on developmentally appropriate practices, with the adult nur-

turing children's curiosity and creating interest in the information. Special-interest hands-on music centers continue to be an important option for meeting the individual developmental needs of children.

The following sections contain statements concerning the music and movement activities of children in kindergarten through second grade. These statements are excerpts from the MENC Standards for grades K–4 (1994b, 13–15).

### *Singing*

Five- through 8-year-old children should be encouraged to continue improvising and composing their own songs. Adults should value these efforts and communicate their worth to the children. Settings that encourage creative song making are sung dialogue plays or prepared strategies for compositions. A sung dialogue could involve expanding the story of "Sing a Song of Sixpence":

*(All sing)*

Sing a song of sixpence, a pocket full of rye.

Four and twenty blackbirds baked in a pie.

When the pie was opened, the birds began to sing.

*(The song stops as children create bird songs/statements, such as "Tweet, tweet" or "Help! Get me out of here . . . I don't want to be baked in a pie . . . Ouch! It's too hot in here . . . . " The song and improvisation continues.)*

Now wasn't that a dainty dish to set before the king?

*(Did the king really like blackbirds with feathers in his pie? Send for the cook. What was the cook's excuse for such a pie? What did the king do to the cook? What did the queen say about this pie?)*

An age-appropriate compositional strategy may be as follows:

*Playing percussion instruments, children plan and write down beats, using their own devised notation, for a musical piece that has moments of sound and a silence and a sudden loudness. Children must choose a conductor, assign people to play instruments, then perform their composition for the class.*

Singing in tune and with rhythmic accuracy is an evolving skill during the primary grades. Most children who have regular opportunities to sing achieve in-tuneness within a group setting and acquire the ability to sing well by themselves by the end of second grade. Teachers must pay attention to range (wide: C–d′; narrow: D–A) and complexity of the melody when expecting children to respond accurately in song. Many adults tend to pitch songs in their own lower range of comfort rather than in an appropriate range for a child's voice, unwittingly creating in-tune problems for the young singer. Young children also have difficulty accurately singing most songs written in the "pop-tune" style; therefore, such songs should not constitute the majority of song literature presented. Children's folk songs have endured and been handed down through the years because young children like them and have success in performing them.

**Music Education Standards for 5- through 8-Year-Olds**

| *Content Standard* | *Achievement Standard* |
|---|---|
| Singing, alone and with others, a varied repertoire of music | Children<br>**a.** sing independently, on pitch and in rhythm, with appropriate timbre, diction, and posture, and maintain a steady tempo;<br>**b.** sing expressively, with appropriate dynamics, phrasing, and interpretation;<br>**c.** sing from memory a varied repertoire of songs representing genres and styles from diverse cultures;<br>**d.** sing in groups, becoming aware of the need to blend vocal timbres, matching dynamic levels; and<br>**e.** improvise, create, and arrange short songs. |

### *Movement*

Children begin each new learning in an enactive mode, sensing and doing. Movement is a doing, concrete expression of what is being experienced and remains a valuable tool for eliciting understanding. Children continue to expressively move to music that they produce or hear performed by others. As psychomotor skills develop, the learner is more able to accurately respond to distinct musical ideas, for example, by performing rhythm patterns, moving with same and different phrases, and reflecting melodic contour. As children interact with music, they also increase their movement repertoire, learning that there are many expressive gestures to be used directionally in space and time.

| Music Education Standards for 5- through 8-Year-Olds | |
|---|---|
| ***Content Standard*** | ***Achievement Standard*** |
| Listening to, analyzing, and describing music | Children<br>**a.** demonstrate perceptual skills by moving to music of various styles representing diverse cultures; and<br>**b.** respond through purposeful movement to selected prominent music characteristics or to specific music events while listening to music. |

### *Playing musical instruments*

Musical instruments, by their very nature, provide the type of hands-on experiences that are so highly recommended by educators for developing young children. Five- through 8-year-old children continue to enjoy the sounds of instruments, further developing their understanding of classroom, social, and orchestral instruments through many sensing–doing experiences. Performance skills increase as their psychomotor skills develop. Classroom instruments such as xylophones, small percussion instruments, and autoharps tend to be the ones most successfully played by this age group. The refined motor skills and cognitive development needed to perform on the piano and on string instruments are still developing at this time; therefore, playing these musical instruments is more appropriately initiated when the child is about 9 years of age.

Instrumental play may involve using sounds to freely express ideas in a story or in nature or to perform distinct musical ideas. Appropriate activities may consist of creating compositions using pre-set scales (pentatonic, whole tone), performing accompaniment patterns, and playing melodies.

### *Reading and writing music*

Children in the primary grades are growing in their ability to deal with more abstract written representations of musical ideas. The sequence in building musical understanding is to begin with sensing and doing, then move to representing musical ideas with pictures of sound (icons), and finally, progress to representing musical ideas with traditional symbols (e.g., quarter notes, half notes). Each stage of the sequence is essential to the building of musical understanding. Children should not be rushed to the symbolic stage; using symbols is relatively easy after children have had the appropriate sensing and doing experiences associated with the symbol. The teacher must help the child make transfers from one level of representation to the next, never assuming that the child will automatically make the necessary associations, as illustrated in the following activity.

| Music Education Standards for 5- through 8-Year-Olds | |
|---|---|
| ***Content Standard*** | ***Achievement Standard*** |
| Performing on instruments, alone and with others, a varied repertoire of music | Children<br>**a.** perform on pitch, in rhythm, with appropriate dynamics and timbre, and maintain a steady tempo;<br>**b.** perform easy rhythmic, melodic, and chordal patterns accurately and independently on rhythmic, melodic, and harmonic classroom instruments;<br>**c.** echo short rhythms and melodic patterns;<br>**d.** perform simple independent instrumental parts while other children sing or play contrasting parts;<br>**e.** improvise "answers" in the same style to given rhythmic and melodic phrases;<br>**f.** improvise simple rhythmic and melodic ostinato (repeated melodic or rhythmic pattern) accompaniments;<br>**g.** improvise short instrumental pieces, using a variety of sound sources, including traditional and nontraditional sounds available in the classroom;<br>**h.** identify the sounds of a variety of instruments, including many orchestra and band instruments and instruments from different cultures;<br>**i.** create and arrange music to accompany readings or dramatizations; and<br>**j.** create and arrange short instrumental pieces within specified guidelines. |

*Play movement games using the pattern "One, two, tie my shoe" (long, long, short short, long): Draw a picture of the rhythm pattern using horizontal long and short lines. Perform the pattern using "ch" vocal sounds. Add quarter notes over the long lines and eighth notes over the short lines. Again perform the pattern using "ch" sounds while viewing both lines and traditional symbols. Then erase the pictures of sound (the lines), leaving only the traditionally notated pattern.*

It is quite appropriate for second-grade children to continue their response to pictures of sound, as well as to interact with traditional music notation. It is not appropriate to rush the 5-year-old child into responding to traditional notation.

**Music Education Standards for 5- through 8-Year-Olds**

| *Content Standard* | *Achievement Standard* |
|---|---|
| Reading and notating music | Children<br>**a.** become aware of and read whole, half, quarter, and eighth notes and rests in $\frac{2}{4}$, $\frac{3}{4}$, and $\frac{4}{4}$ meter signatures;<br>**b.** use a system (that is, syllables, numbers, or letters) to read simple pitch notation in the treble clef in major keys;<br>**c.** identify some symbols and traditional terms referring to dynamics, tempo, and articulation and interpret them correctly when performing; and<br>**d.** use standard symbols to notate meter, rhythm, pitch, and dynamics in simple patterns presented by the teacher. |

## Assessing the music experiences of young children

Adequately assessing the effectiveness of young children's music experiences is fraught with problems, because music is a temporal happening, with us for a moment and then too quickly a part of memory. Certainly the skills and sensitivity involved in music making are observable; however, that which we deem most important—the way in which music emotionally moves the individual—is evasive and impossible to adequately describe or assess. Most young children have not yet learned to hide their true feelings, the way adults tend to do. The openness and sheer joy of involvement can often be observed in their gestures, facial expressions, and overall manner. Even so, the subjectivity of the evaluator comes into play.

If the major goal for early childhood music education is that young children should acquire a disposition for lifelong musical interest, then evaluation cannot focus solely on accuracy of musical performance (i.e., pitch matching, musical giftedness). We must include information that reflects an attitudinal profile, as well. Individual case studies should contain both observable narrative information (vignettes, checklists, diaries, or interviews) and, when appropriate, individual criterion-based performance data. Teachers may gather such information by observing individuals within the group or by following their independent play. When preparing a portfolio, the evaluator should consider the following suggestions and questions related to what is being observed.

***Approach tendencies.*** Observe how children play during choice time and during small- or large-group music experiences. Develop a descriptor scale: Is the child disinterested, fearful, reluctant, cautious, watchful, willing, aggressive, enthusiastic, gleeful? Notice the effect of distance on the child's comfort level. Is the child a far-off observer, far-off participant, nearby observer, nearby participant, on-site observer, or on-site active participant? Many children who do not quite trust the environment or other people learn a great deal as far-off observer.

***Time on task.*** Does the duration of the child's interest at a musical task provide useful information? How frequently does she or he return to the music play area?

***Musical dispositions.*** Does the child display curiosity, self-initiate use of music, respond emotionally, and appear to value music?

***External reports.*** Interview parents and other adults who interact with children about the use of music outside the center or school environment. Does the child show a delayed response to classroom music experiences? Does the seemingly nonparticipating child perform musical ideas heard in the center later at home, in the car, or at other play sites? What is the frequency of this delayed, self-initiated play?

***Measurable musicianly behaviors.*** Include in the portfolio data about performance skills and knowledge

level that reflect conventional music "rules," such as singing in tune, rhythmic accuracy, and ability to use notation. Acquiring this assessment information is relatively easy because there usually is a yes-or-no response. Such information should be weighed with careful attention to the developmental appropriateness of the expectation or skill and its overall importance in the program goals for the young child at a given time. The MENC Standards provide generally useful guidance for these decisions; in applying the standards, however, teachers and specialists must always take into consideration what they know about individual children within a specific cultural context.

## Conclusion

Music experiences for children from birth through 8 years of age must be planned to accommodate children's unique learning styles. A rich and diverse learning environment affords places for all children at various levels of ability to successfully participate in music. A developmental approach to both the learner and the content provide a framework for an effective early childhood music curriculum.

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# 9

# Transforming Curriculum in Social Studies

*Carol Seefeldt*

All of American education has the goal of preparing the young to become productive members of a democratic society. The social studies, however, are uniquely suited to fostering the knowledge, attitudes, values, and skills believed necessary for citizens not just to participate in a democratic society but to continually improve and perfect that society.

Defined as those studies concerning the nature of people and the world, the heritage of the past, and all of contemporary social living (NCSS 1989), social studies is an enormous, complex field. Anthropology, archeology, civics, economics, geography, history, philosophy, political science, psychology, religion, and sociology, as well as appropriate content from the humanities, mathematics, and sciences, are included in the social studies. Add social science skills, social skills, and the dispositions required to participate in a democracy to the vast list of social sciences, and the field becomes even more enormous, complex, and difficult to conceptualize.

How do teachers, especially those of children younger than age 7 or 8, decide what of the enormous field of social studies to teach? How do they select content or decide which attitudes or skills are important to teach during the period of early childhood?

Because young children do not easily learn unconnected, meaningless facts, teachers have tried to select concepts that they perceive as key to a given discipline and then plan themes, units, or projects around these concepts. But teachers are not archaeologists, geographers, or historians. They are not prepared to identify which concepts are key to a given discipline.

Optimistically, teachers and curriculum developers looked to the development of the national standards. By identifying what American schoolchildren should know and how society knows they have learned it (Ravitch 1995), it was hoped that the standards would guide teachers in the selection of key concepts around which they could then organize their social studies curriculum.

This has not been the case with the geography standards, *Geography for Life: National Standards—1994* (GESP 1994a), or with the civic standards, the *National Standards for Civics and Government* (CCE 1994). As written, these standards will disappoint many teachers. Instead of identifying key concepts that have the potential to organize the curriculum, they list numerous facts, skills, and knowledge embedded in dozens of content and performance standards that children are expected to achieve by the time they complete the fourth grade. The geography standards, alone, state 57 content standards (that is, what children are expected to know and understand), 62 performance standards, and 189 specific performance standards. The civics standards list 29 content standards and 95 performance standards. Embedded in each of the standards are numerous facts and concepts, negating any possibility of teachers using the standards as a *guide* in selecting key concepts.

More importantly, the geography and civics standards fail children. Identifying meaningful, key concepts by experts in a given field is but one step in the

teaching/learning process. The other necessary step is knowing and understanding what is key and meaningful for young children. Created with apparently limited knowledge of young children and how they learn, the geography and civics standards are overwhelming. It is difficult to imagine any child mastering, during the period of early childhood, the vast amount of knowledge and numerous skills proposed by the geography and civics standards.

The critical problem though, is not the number of standards but their developmental inappropriateness. The geography and civics standards call for mastery of abstract concepts that are not attainable by most children between 3 and 8 years of age. For example, the ability to understand, at a conventional adult level, the symbolization of map keys or the balance of power between the three branches of government is well beyond this age group. If such mastery is expected, children's learning will be superficial at best. By not considering children's cognitive maturity, the geography and civics standards, rather than preparing children to become citizens of American democracy, may have the opposite effect, discouraging children's potential interest in the study of geography and civics.

Instead, teachers can introduce children to important geographic and civic concepts at the level of awareness and exploration, knowing that these ideas will have to be revisited over time for conventional adult understandings to develop. What one wants a child to learn must be relevant to the child's present knowledge and concepts (Hunt 1961). In other words, the child must have some rudimentary understanding and related knowledge before he can learn the new concept. Vygotsky explained the importance of matching what is to be learned with the nature of children's cognitive maturity this way: "It is a well known and empirically established fact that learning should be matched in some manner with the child's developmental level" (Vygotsky 1962, 85). For example, directionality, which is a key concept of geography, can be taught in kindergarten by giving children simple directions to negotiate the school building and helping them practice repeatedly ("To get to the girls' bathroom, turn right, count two doors, and it's the third door"). As children master the basic idea of following directions, the tasks can become more complex, helping to draw their attention to landmarks and signs ("Describe how we get to the playground from our classroom." "How do grownups find their way when they go someplace new?" "How do you know when you're almost home?").

Unlike the geography and civics standards, *National Standards: History for Grades K–4* (NCHS 1994) offers teachers guidelines that can be used to organize their curriculum. In contrast to the geography and civics standards, which list dozens of facts as important outcomes, the history standards list eight essential elements and five thinking skills. The five thinking skills—chronological thinking, historical comprehension, analysis, research, and decision making—are the *outcomes* of the history standards children are expected to gain. Instead of calling for children to describe, explain, identify, list, write, or define numerous facts and concepts, the history standards ask that children listen, observe, read, investigate, compare, interview, and draw upon stories, folktales, poetry, and other literature in order to gain the five thinking skills.

Based on the concept that "children's study of history involves much more than the passive absorption of facts, names, dates, and places" (NCHS 1994, 15), the five historical thinking standards are designed to engage children's minds through meaningful, first-hand experiences integrated into the total curriculum. To do so, the standards state, means arranging conditions for learning that "foster children's natural curiosity and imagination" (p. 3).

Further, the history standards are firmly based on the nature of children and the way they learn. Divided into sections for Grades K–2 and 3–4, the history standards are written with children in mind. Accepting the fact that during the primary grades children will only "begin to build historical understandings and perspectives" (NCHS 1994, 3), the standards do not ask that young children achieve the unachievable but that educators "adapt the program to the child instead of waiting for the child to attain readiness for the program" (Hunt 1961, 42).

This chapter is organized around the three social studies disciplines of geography, history, and civics education. Suggestions are given for introducing concepts embedded in the standards that are meaningful to children. Additionally, learning experiences are described that have the potential to build the experiential foundation necessary for later abstract learning from the three disciplines.

## Geography

"Geography and geography education are essential to the future of all American children—starting now" (GESP 1994b). The study of geography does start now—"unofficially at birth" (Mitchell 1934). This study is not that of memorizing the names of countries or their capitals or locating them on a map. Nor, for the most part, is it the study of geography as delineated in the *Geography for Life: National Geography Standards* (GESP 1994a) (see adjacent box). Children's

## Geography Standards* Grades K through 4*

| *Content Standard* | *Achievement Standard* |
|---|---|
| **The World in Spatial Terms** | |
| **1.** How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective | Children<br>• examine a variety of maps to describe basic elements (e.g., title, legend, cardinal and intermediate directions, scale, grid, principal parallel, meridians);<br>• use symbols to locate, identify, and mark features of the local community on a prepared base map; and<br>• calculate the density of specific features within a grid placed over a map. |
| **2.** How to use mental maps to organize information about people, places, and environments in a spatial context | |
| **3.** How to analyze the spatial organization of people, places, and environments on earth's surface | |
| **Places and Regions** | |
| **4.** The physical and human characteristics of places | Children<br>• observe and describe the physical characteristics of the local community in words and sketches, using a data-retrival chart;<br>• compare the student's own region on another continent and explain how they are similar and different; and<br>• describe how different people perceive places and regions. |
| **5.** That people create regions to interpret earth's complexity | |
| **6.** How culture and experience influence people's perceptions of places and regions | |
| **Physical Systems** | |
| **7.** The physical processes that shape the patterns of earth's surface | Children<br>• explain how the length of day can influence human activities in different regions of the world; and<br>• collect samples of components of a local ecosystem and arrange them in a diorama model of the ecosystem. |
| **8.** The characteristics and spatial distribution of ecosystems on earth's surface | |
| **Human Systems** | |
| **9.** The characteristics, distribution, and migration of human populations on earth's surface | Children<br>• study a U.S. map showing population densities and then write an account suggesting how differences in density are related to location;<br>• identify the components of culture, beliefs, and customs;<br>• classify land in a community by types of economic activity and prepare a map showing the different uses: industrial, recreational, commercial, residential;<br>• read narratives and poems about a type of community unlike that of students'; and<br>• prepare an atlas that shows a variety of territorial units. |
| **10.** The characteristics, distribution, and complexity of earth's cultural mosaics | |
| **11.** The patterns and networks of economic interdependence on earth's surface | |
| **12.** The processes, patterns, and functions of human settlement | |
| **13.** How the forces of cooperation and conflict among people influence the division and control of earth's surface | |
| **Environment and Society** | |
| **14.** How human actions modify the physical environment | Children<br>• prepare an illustrated chart to show how the atmosphere, biosphere, lithosphere, and hydrosphere contribute to the student's daily life;<br>• list ways in which people adapt to the physical environment; and<br>• put symbols on a base map to identify the locations of sources of nonrenewable resources and explain how each resource is used. |
| **15.** How physical systems affect human systems | |
| **16.** The changes that occur in the meaning, use, distribution, and importance of resources | |
| **The Uses of Geography** | |
| **17.** How to apply geography to interpret the past | Children<br>• arrange in chronological order pictures of types of houses built in the student's region and explain why the size and style of such homes have changed over time; and<br>• describe the relationship between population growth and resource use by interpreting a graph containing information on both topics. |
| **18.** How to apply geography to interpret the present and plan for the future | |

* *Excerpted with permission. The full standards provide additional detail.*

study of geography is like that of the social scientist. During the period of early childhood, children are geographers. They dig in the sand, pour water, watch rain fall, and explore themselves in space, all in an attempt to find out about the nature of the world and their place in it (Seefeldt 1993).

As they explore their world, children use all the skills of the geographer. They ask questions, first asking, "What is this?" and "What is this smell?" and then, "Why is it this way?" and "What caused this shape?" And finally, they begin to speculate, "Does corn always grow in this field?" Children try to answer their questions by collecting information through their explorations and experiments with their world; by using reference materials, videos, or texts; or by interviewing experts. The information they collect is organized. The children draw maps, create graphs, construct displays, and read and listen to stories. They make connections between the bits of information that they have been collecting, they discover relationships, and they find answers to their questions.

Because children use the skills of the geographer, for early childhood educators the most salient feature of the national geography standards is the third chapter, "Geography Skills and Perspectives." The five skills to be acquired by the end of fourth grade—asking questions, acquiring, organizing, analyzing, and answering these questions—can guide teachers in selecting appropriate geography curriculum.

As a guide for planning appropriate geography education, teachers can begin by thinking in terms of how the 18 abstract geography standards can be made interesting and meaningful enough to stimulate children to ask questions, and if they decide which concepts embedded in the standards can be introduced to children through firsthand experiences, teachers will have a guide for planning appropriate geography education. Examples follow of how this might be done in three of the six essential geography elements: The World in Spatial Terms, Places and Regions, and Physical Systems.

## *The world in spatial terms*

The first set of standards revolves around children gaining the ability to use maps and other geographic representations, tools, and techniques. Although, during the period of early childhood, children will not be able to master in any meaningful way the standard of "describing the basic elements of legend, cardinal and intermediate directions, scale, grid, principle parallels, meridians" (NGRE 1994, 106), they can become familiar with maps and with using directions and locations.

***Mapping.*** "What is this?" asked a kindergarten teacher, holding a globe.

The children chanted in unison, "It's a globe."

"That's right." The teacher continued, "What are the blue parts?"

"Water!" the children shouted together.

"Yes! Good!" the teacher said. "Now, what are the brown parts? Except on this globe the brown parts are orange, or yellow, purple, or green."

Maps and globes have a place in schools for young children (Muir & Cheek 1991; Liben & Downs 1993)—not, however, in the hands of a teacher who tells 5-year-olds about globes and then expects them to know that the brown parts, which are actually yellow or purple or green, represent land.

Using their own knowledge and understanding of maps, not the conventional knowledge presented in the standards, children are able to follow a map while on a field trip, place pictures of furniture on a map representing their classroom, and quite expertly find hidden "treasures" in their room or playyard by following a map (Miller 1985; Marzoff & DeLoache 1994).

Mitchell (1934) used the terms *floor map,* and *tool map* to apply to those maps that are not accurate but intended to introduce children to the general concept of mapping. They are "rough maps which are not an end in themselves, but a means to better play and better thinking" (p. 28).

By age 5, as well, children find maps placed in the block area motivating. A large floor map of the route of the New York City Marathon was made by teachers as part of a unit on the marathon (Davis 1991). Before the marathon, the children made predictions about how many people would run in the marathon, who they were, and who would win the marathon. They walked part of the route of the marathon. After the marathon, children used blocks to build the Empire State Building, Wall Street, and the World Trade Center on top of the map.

Floor maps, road maps, and strips or circles of brown and blue papers placed near the blocks stimulate children to build maps of their environment. The brown paper strips often are used to represent streets or roads, and the blue papers, lakes, rivers, or streams.

Once familiar with maps, children begin to make their own, organizing information they have acquired through their explorations. In fact, children may build, draw, or paint maps well before they are able to read them. Grady, a 5-year-old whose parents frequently used maps and talked about the routes they would take to different places because they were new to the area, painted a quite accurate map of the route his parents took to his kindergarten. The streets from his

***CHILDREN WITH DISABILITIES THAT PREVENT THEIR MOVING BY THEMSELVES IN SPACE HAVE AN EVEN GREATER NEED TO EXPERIENCE THE PHYSICAL PROPERTIES OF SPACE.***

home to school were labeled and were accurate to Grady. The map was not, however, accurate in scale, perspective, or cardinal and intermediate directions, nor did it include parallels or meridians.

Rarely would a child younger than age 10 or 11 be able to master the abstract and complex concepts of representation, symbolization, orientation, and direction found in the geography standards. Before 10 or 11 years of age, children have little conceptual understanding of perspective, scale, and representation. Not until around age 12 are most children able to conceptualize the total relationship of a map to the objects it represents or to infer information based on those relationships (Hatcher 1983; Brown 1986; Joyce 1987; Mosenthal & Kirsch 1990).

***Directions and locations.*** "Here is where we live," the teacher with the globe continued, pointing to a spot on the globe. "What is the name of our country?"

The children, drilled in the correct responses, were ready to answer and shouted, "The U.S.A.!"

"Correct," the teacher said, and then she asked them to name the state, city, and county they lived in. During the recitation, the teacher sent two children from the group for not paying attention. Continuing the lesson, the teacher asked, "Do we live north or south of Jefferson City?" "That's right," she said when the children replied that they lived north of the city. "North is always up. We live up from Jefferson City."

Learning concepts of direction and location are important; nevertheless, children do not learn these concepts through rote recitation or by being shamed for not listening to erroneous information, such as that north is "always up." And while children before third grade may not be able to master the ability to identify natural and human-made features or transportation and communication routes on maps, as suggested in the standards, they can be introduced to these concepts through firsthand explorations of their immediate world.

Knowing that development of the abstract concepts of direction is best gained through sensorimotor experiences, teachers plan many opportunities for children to climb, jump, run, roll around, play—to physically experience themselves in space. Three- and 4-year-olds climb in and out of boxes and play circle games such as Ring Around the Rosie or Farmer in the Dell. Fives climb higher on the jungle gym and begin using the vocabulary of direction. Circle games such as Simon Says or Looby Loo involve understanding and attending to direction terms, such as *right/left, up/down,* and *forward/backward.*

Children with disabilities that prevent their moving by themselves in space have an even greater need to experience the physical properties of space. One teacher took the time to arrange children's wheelchairs in circles and played circle games. Another went to great lengths to take her group, including several children with spina bifida, to trips through the community on the theory that these children, even more than those who could move through space freely on their own, needed to experience themselves in space.

While it might be imperative to correct a teacher who tells children that "north is always up," there is no need to correct young children's use of directional terms, such as *north, south, east,* or *west.* Children will not gain conventional adult concepts of direction until early adolescence. During early childhood, children need only become aware of the use of directional terms and have the opportunity to hear these terms as they experience themselves in space. Even a basic directional concept such as *left/right* takes many years to fully develop; for example, although preschool children can identify left and right parts of their own body, not until after age 7 or 8 can they do so when looking at someone else (Roberts & Aman 1993).

## *Places and regions*

Children can learn to identify the physical characteristics of the places in which they live, naming the land forms, bodies of water, soil, vegetation, weather, and climate in their immediate environment, as stated in the geography standards, but from their own perspective.

***Physical characteristics.*** Three- and 4-year-olds need only become aware of the physical characteristics of the Earth they live on. Using the words *hard/soft, rough/smooth, sandy/loamy,* and *water/land,* these young children are beginning to identify and then categorize the surfaces of the Earth. Walking field trips can extend children's concepts. Teachers can ask children to observe the surfaces they walk on, decide which is hard or soft, or describe how their feet feel when they walk on gravel, grass, sand, or concrete during walks around the block and through their own explorations into the community.

Depending on the characteristics of the immediate environment and the children's interests, kindergarten and primary-grade children might begin to identify land forms in their community. Following a map, children could walk to a nearby field, hill, wetland, or river to observe and chart the characteristics of the land around them.

Back in the classroom the children can obtain additional information about the physical characteristics of the land forms through reference books, videos, or photographs. Children can compare the river they observed with pictures of rivers far away. Reference materials, if carefully selected to match children's interests and needs, can also expose children to far-off land forms that they can only experience vicariously.

***Places shaped by humans.*** Primary-grade children begin to observe how the nature of the earth determines how people live on the earth, as well as gain the idea that people change the earth for their own purposes. Inquiry takes place as children examine, investigate, and propose explanations of how people travel, live on, and use the different surfaces of the earth. A series of trips to the waterfront to observe ships docking, or to a railroad yard to watch freight trains switching engines, or even to garages, gas stations, or grocery stores acquaints children with the idea that people travel on the earth and use land and water for their own needs.

It is rare for a community not to have some type of ongoing construction taking place. Hills are moved or created as highways are built, earth is covered with concrete and buildings, and rivers and lakes are dammed or diverted. Whether the construction taking place is something as simple as replacing underground wires or as complex as building a new highway, teachers use the situation to introduce children to the idea that humans change the geography of the land to suit their own purposes.

## *Physical systems*

"Now," said the teacher, holding the globe, "it is daytime here. What is it over here?" she asked, revolving the globe and pointing to another spot. No one answered, so she asked again. She continued, "Over here is where Lin's grandmother lives. Where does Lin's grandmother live?"

"China!" the children shouted.

"That's right. And what time is it in China?"

"It's daytime," one child said. "You can see the sun."

Another said, "And it's not going to rain today. It's all sunny."

What did the children learn? It is difficult to say, but we can conclude that none learned the concept being taught: that the planet Earth rotates on its axis and revolves around the Sun—highly abstract concepts. One cannot observe the rotation nor see the planet Earth revolve around the Sun. Using models of the solar system, as suggested in the geography standards, may help adults conceptualize these phenomena but does little to help children do so. How can children, who think the moon is theirs alone and follows them around at night (Piaget 1951) and who are just beginning to use a symbol system, relate the solar system to an orange and an apple that a teacher moves around a globe? Children can, however, begin to construct embryonic understandings of physical systems by experiencing and exploring the consequences of the Earth's movements: shadows, night and day, and climate changes.

Children in the primary grades enjoy play with shadows, one way to introduce the idea of Earth's rotation around the Sun. Using an idea from *Early Experiences* (Science 5/13 1973), a primary-grade teacher initiated a unit on shadows by reading Robert Lewis Stevenson's poem "My Shadow" (Stevenson 1924) and teaching the children how to play shadow tag—tagging their classmates by stepping on their shadows.

Each day she asked the children a question designed to make them think about the nature of shadows, such as whether the children could draw around their own shadow; whether they could cover their shadow completely; whether they could shake hands with someone else's shadow; whether objects, such as umbrellas, balloons, or boxes, also have shadows; and finally, whether shadows change. To answer this last question, she had the children use chalk to draw around their shadows on the playground at the beginning of the school day, in the middle of the day, and at the end of the day and compare their drawings. The next day the children tried the same experiment, this time tracing their shadows on large brown paper, thereby making a more permanent picture of their shadows. The question arose of why the shadows changed in size during the day. The children advanced hypotheses and made predications. Reference books were consulted and additional experiments conducted.

The position of the sun during the day was charted and discussed. The group finally concluded that the sun, or other light source, is needed to create shadows and that the position of the sun changes during the day. This conclusion, while not accurate or complete, was a firm foundation on which children could build the abstract concepts given in the geography standards once past the period of preoperational or concrete thought.

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### *Can children achieve the geography standards?*

Obviously, experiences with shadows, playing with maps, and choosing appropriate clothing will not fully prepare children to master the abstract concepts of the national geography standards. Nevertheless, these early explorations—beginning with questions and ending with organizing and analyzing information to answer the questions—are essential. Through these explorations children develop everyday concepts or embryonic knowledge of themselves and their geographic world, knowledge without which children would unlikely be able to gain the conventional concepts delineated in the national geography standards (Pintrich, Marx, & Boyle 1993). As Vygotsky explains,

> An everyday concept clears the path for the scientific . . . it creates a series of structures necessary for the evolution of a concept's more primitive, elementary aspects, which give it body and vitality. Scientific concepts grow down through spontaneous concepts; spontaneous concepts grow upward through scientific concepts. (1962, 109)

Regardless, these elementary concepts do not develop automatically through children's explorations with their world. Learning geography requires the sensitive interaction of an adult who gives children verbal labels; extends their experiences with reference materials, books, and pictures; and continually asks children to question, to speculate, and to reflect on their experiences and reach conclusions. A master teacher is needed who understands what children already know and understand, and then—capitalizing on daily, naturally occurring and planned experiences—extends, expands, and clarifies children's personal knowledge of geography.

## History

Knowledge of history is essential. It "is the precondition of political intelligence. Without history, a society shares no common memory of where it has been, of what its core values are, or of what decisions of the past account for present circumstances" (NCHS 1994, 1). Without history, there can be no sensible inquiry into the issues facing society nor move to effective participation in the democratic processes of governance.

History is a broad, integrated field, "recounting and analyzing human aspirations and striving in at least five spheres of human activity: social, scientific/technological, economic, political, and cultural" (NCHS 1994, 5). To bring order to the field, two types of standards are given in *History for Grades K–4: Expanding Children's World in Time and Space* (NCHS 1994). These skills, listed in the adjacent box, are historical thinking skills and historical understandings. The five standards in historical thinking—separate, yet interactive and mutually supportive—are (1) chronological thinking; (2) historical comprehension; (3) historical analysis and interpretation; (4) historical research capabilities; and (5) historical issues-analysis and decision-making. The eight essential elements define what children should know about the history of their families, their community, their state, their nation, and the world.

Because most of the elements and the historical thinking skills are abstract, the standards strongly advocate using literature to make them more meaningful to children. "This approach focuses instruction on compelling selections of literature appropriate for children from many historical periods, and then expands those studies to explore more deeply the historical times they bring to life" (NCHS 1994, 4).

The standards specify that children should engage in discussing and questioning the stories they hear. Teachers can ask children to recount the narrative and talk about the characters, the events that occurred, where they happened, why they occurred, and what were the motives and consequences of these events. By doing so, children will "develop the ability to describe the past on its own terms, through the eyes and experiences of those who were there, as revealed through their literature, diaries, letters, arts, artifacts, and the like" (NCHS 1994, 20).

The standards also recognize the necessity of basing learning on firsthand experiences that hold personal meaning for children. The history standards give responsibility to teachers, who "will draw upon all these Thinking Standards, as appropriate, to develop their teaching plans and to guide students through challenging programs of study in history" (NCHS 1994, 16). The following section takes the first standard, Chronological Thinking, and illustrates how teachers can foster this skill through integrated, meaningful learning experiences.

**History Standards—Grades K through 4***

**Five historical thinking skills**

Chronological thinking
Historical comprehension
Historical analysis and interpretation
Historical research capabilities
Historical issues and decision making

**Eight historical understandings**

*Element 1:* Family life now and in the recent past; family life in various places long ago

*Element 2:* History of students' local community and how communities in North America varied long ago

*Element 3:* The people, events, problems, and ideas that created the history of their state

*Element 4:* How democratic values came to be, and how they have been exemplified by people, events, and symbols

*Element 5:* The causes and nature of various movements of large groups of people into and within the United States, now and long ago

*Element 6:* Regional folklore and cultural contributions that helped to form our national heritage

*Element 7:* Selected attributes and historical development of various societies in Africa, the Americas, and Europe

*Element 8:* Major discoveries in science and technology, their social and economic effects, and the scientists and inventors from many groups and regions responsible for them

** Excerpted with permission. The full standards provide additional detail.*

### *Chronological thinking*

"Chronological thinking is at the heart of historical reasoning. Without a sense of historical time—time past, present, and future—students are bound to see events as one great tangled mess" (NCHS 1994, 18). An understanding of time is a necessity, but young children have little sense of conventional time. Further, most children are not ready for instruction

in time until well past 7 or 8 years old (Vukelich & Thornton 1990). The understanding of conventional time, which requires logical thought and involves understanding relations of succession and duration, does not fully develop until early adolescence (Piaget 1971; French & Nelson 1985). Thus, children will not be able to gain conventional concepts of chronological history until they are in junior or senior high school.

Although young children are not ready to conceptualize chronological history, even preschoolers are aware of time and are interested in learning about it. Three- and 4-year-olds learn to think in terms of time as they experience the daily, cyclical, recurring, and sequential events of their own lives. While it is inappropriate to teach preschool children formal lessons on the names of the days or months or telling time, it is essential for teachers to organize daily occurrences and regular routines in a predictable and dependable order. When children know they can depend on events and routines occurring with regularity—for example, with story coming before lunch and nap after lunch—they begin to develop the everyday, embryonic concepts of time. "I don't know what time it is," said 3-year-old Fran, "but I know after nap my daddy comes to take me home." Labeling events and routines using the words *today, tomorrow, next, later,* and *long ago* enables children to clarify and begin to categorize their personal ideas of time; these activities are also recommended in the standards.

The names of days of the week and months are examples of social knowledge, which cannot be constructed by each child and, therefore, is simply told to children. Children learn these words as they learn other forms of social knowledge: through living in the culture. Because children learn the names of days of the week and months as naturally as they learn to use the word *chair* to represent the object they sit on or the word *happy* to represent how they feel, teachers should use these names and bring them up in meaningful context, just as they would other social knowledge. Using terms in context is more efficient than spending 20 or more minutes a day reciting the names of the days of the week with the whole group.

To understand history requires a sense of the passage of time. This, too, is developed by focusing on children's everyday, naturally occurring experiences. "Remember when we walked in the rain yesterday and you jumped in the puddles?" a teacher asks a 3-year-old, while a 5-year-old is asked to recall how many days it has been since her birthday or what she can do now that she could not do when she was 4.

By observing the adults around them, children are aware that the passage of time is measured. If clocks, watches, timers, and calendars are placed in dramatic play areas, children model after adults and pretend to measure time. Adults can also use the terms involved in clock time when talking with kindergarten and primary-grade children about their activities and routines.

Although primary-grade children will not yet have internalized the concept of duration of an interval, such as an hour or a minute, they now understand that these terms do have meaning (Elkind 1981). Using these terms helps 5- and 6-year-olds begin to associate the regular daily routines and schedule with clock time. By 8 years of age, children usually have developed concepts of hour, half-hour, and quarter-hour through this natural association of regular activities with clock time (Springer 1952).

***Change.*** If children are to meet the history standards, they must have some idea of the changes that occur "in their own lives, in the history of this school and community, and in the ways people lived long ago and today" (NCHS 1994, 18). However, for young children, whose thought is dominated by perception, change is a difficult concept to gain.

Without the cognitive ability to comprehend change, children are unsure of the constancy and continuity of their own lives. Before age 5, most children are even uncertain of the stability of their own gender (Slaby & Frey 1975); they think that they could change from a boy to a girl, for instance, by wearing a dress. Nor do they understand the changes that occur with illness and death. Blaming imminent justice for both illness and death, a young child's concept of change is indeed primitive: "She got sick because she was bad."

Direct instruction is unlikely to affect children's embryonic understanding of concepts of change. Instead, the history standards suggest that children's daily experiences with change be highlighted and become the foundation on which they will construct ever increasingly conventional and mature concepts of change.

Reflecting on the changes that occur in their own lives, their school, and their community, children begin to understand that change is continuous and always present and affects people in different ways. Within any group, change occurs. Friends leave the community, and new

***THROUGH READING AND DISCUSSING LITERATURE FROM VARIOUS HISTORICAL PERIODS, CHILDREN ENCOUNTER THE PAST ON ITS OWN TERMS, THROUGH THE EYES AND EXPERIENCES OF THOSE WHO WERE THERE.***

friends move in. The schedule changes, and the classroom is rearranged. Walking field trips through the school and community reveal other changes: a house is built, a street repaired, a shopping center closed. The children can note, discuss, and record these changes.

One kindergarten class observed the changes in a neighbor's apple tree throughout the year, recording their observations in drawings, paintings, and charts. Supporting children's developing ability to associate the passage of time with external events, the teacher read the books *The Apple Tree* (Parnall 1987), *The Tree* (Carrick 1971), and *The Little House* (Burton 1942), and the children wrote their own stories and books about their apple tree.

Even though children are interested in the changes that occur in their environment, their greatest interest is in the change that occurs to *them.* Children's interest in the birth of a baby led to informally comparing the baby with themselves and speculating and arguing about their own babyhood. One day the teacher put some baby clothes, along with some books about babies, on the library table. More discussion took place among the children as they tried to put on a tiny sweater or measured baby shoes against their own. Later, the teacher focused the group's discussion on how the children had changed since they were babies and how they would change in the future. As they read books together—*You'll Soon Grow Into Them* (Hutchins 1983), *Pig, Pig Grows Up* (McPhail 1980), and *The Growing Story* (Krauss 1947)—the children continued analyzing and comparing how they had changed and would continue to do so.

***The past.*** People keep records of the past, recording events and their lives in stories and books. The history standards use carefully selected stories not only to introduce children to the past but as a means of stimulating children to reconstruct the literal meaning of the story, place the event in chronology, and discuss the probable motive, hopes, fears, strengths, and weaknesses of the characters involved.

Well-chosen biographies and engaging accounts of the past, such as *When I Was Young in the Mountains* (Rylant 1982) and *Tell Me a Story, Mama* (Johnson 1989), can bring meaningful awareness of the past to the youngest of children. Reading stories about children long ago or far away helps children "develop the ability to describe the past on its own terms, through the eyes and experiences of those who were there . . . and to avoid 'present-mindedness,' not judging the past solely in terms of the norms and values of today, but taking into account the historical context in which the events unfolded" (NCHS 1994, 20).

Families have their own stories of the past. Children in the primary grades can develop questions, conduct interviews, and collect family photos and other records from their family's past (NCHS 1994). After their research, the children might present a family history through two generations in a picture time line, family tree, or oral presentation to describe the history of their own family or of a family portrayed in children's literature (NCHS 1994).

Artifacts from the past can be displayed and handled. One child's grandmother brought to class an eggbeater that her mother had used. The children compared this eggbeater to current eggbeaters—handheld beaters with ball bearings, as well as electric beaters. The children predicted how long each would take to whip eggs, measured the time each took, and reached conclusions.

The most interesting stories of the past, however, are those of the children's own lives. A history book of each child—with photos taken at different times of the year, a chart of their height and weight, a few anecdotes of the things they said and did during the year as samples of their work—is the best loved history book of all. Children find these books, full of personal meaning, of high interest. Because these personal history books are so meaningful, children attend to and become aware of the concepts of past, present, and future.

Groups can make their own history books, as well. In these books children record their favorite events and experiences of the past year. Each child draws or writes a page of the book. The pages are duplicated so that every child has a copy of, for example, "Our Year in First Grade."

Five- and 6-year olds enjoy the drama of time lines that record the history of their lives. One teacher, knowing that going over the conventional calendar each morning had limited meaning for 5-year-olds, used a large calendar as a means of keeping a time line. At the close of the day, first with pictures and then with writing, children recorded the events of the day. At the end of each month, the teacher hung that month's calendar page in a little-used alcove. Children were observed throughout the year, gathering in the alcove to talk together about their immediate past. In the process of telling their own narratives of the past, these children were developing the realization that history is the story of people, recorded by people like them, and that they were "right now making their own past and future" (NCSSS 1989, xi).

***Continuity of life.*** Regardless of how things change, there is continuity to the human experience.

The security that comes from understanding that life has continuity can be conveyed through interaction with elders (Seefeldt & Warman 1993).

Elder volunteers might share some of the games they played when they were children. In one class an elder showed how she played jacks, cards, and "cooties," a game in which one child tossed a die and then drew parts on the bug, or cootie. The children then showed her how they play pogs and their current plastic cootie game.

Following the visit they read *Children of Long Ago* (Little 1988) and made a class list of their favorite games, comparing their list with the games and activities found in the book. The list was sent home, and children interviewed parents, grandparents, aunts, and uncles, asking them to tell about their favorite games and play activities when they were children. As the lists were compared and discussed, the children found that although games and toys have changed over the years, there are great similarities between today's games and those of long ago.

Stories help convey the continuity of life. *Storm in the Night* (Stoltz 1988) and *What's Under My Bed?* (Stevenson 1983) convey the idea that all children, regardless of when they were young, have similar feelings. *Knots on a Counting Rope* (Martin 1987), the story of a Native American boy and his grandfather, who recalls his past; *The Chalk Doll* (Pomerantz 1989), a mother telling about her childhood in Jamaica; and *Watch the Stars Come Out* (Levinson 1985), the story of a mother's long trip by boat to America—all touchingly transmit the fact that life changes yet is continuous.

### *Can children achieve the history standards?*

The history standards place a heavy responsibility on teachers. By having to internalize the standards and then use children's immediate environment as a laboratory in which children are to achieve the standards, teachers must become the double specialists Piaget (1969) wrote about. It is the teacher, not the history standards, who is given the responsibility of being a specialist of history and of children and then bringing together knowledge of the two.

Reliance on the professional judgment of teachers, however, increases the likelihood that the history standards will be successful, because it is the teacher, not a national committee, who knows what parts of the standards hold meaning and interest for the children. And it is only the teacher who will be able to structure age-appropriate experiences in the classroom and community through which children will gain knowledge of history.

## Civics: Participation and citizenship

At the same time that their embryonic concepts of geography and history are being clarified and expanded, children are also developing the disposition and skills required of citizens of a democracy. "While it is true that history, economics, literature, and other subjects do enhance students' understanding of government and politics, they cannot replace sustained, systematic attention to civic education" (CCE 1994). The Center for Civic Education has specified the goals and standards that this formal, systematic instruction in civics should include, beginning in kindergarten. The box on page 120 presents the five questions around which the standards revolve, as well as examples of performance standards.

Carefully and thoroughly delineated from the perspectives of authorities and scholars in the field of civic education, the standards are comprehensive and extensive. Nevertheless, because the standards tend to focus on abstract concepts, young children—who are more capable of understanding concepts with concrete referents—cannot fully master the knowledge and skills delineated in the standards.

### *Appropriate goals for civics education*

Teachers can look to the basic principles of living in a democratic society to guide their planning and teaching of civics to young children. These principles are based on the ideas that becoming a productive member of a democracy requires

- a willingness to participate in improving the quality of life in their community, their nation, and the world;
- the ability to take the perspectives of, cooperate with, work with, and respect others; and
- knowing the mechanics of rule setting, voting, and when, where, and how to balance personal interests with the common good.

### *Willingness to participate*

The knowledge, skills, and attitudes required of a citizen in a democracy are best learned by experiencing them. Within the small democracy of an early childhood program, children experience and then gain an understanding of the dichotomy of socialization—developing a strong sense of individuality while learning to give up some of one's self for the welfare and good of the group.

When children feel valued and respected, they, in turn, are able to value and respect others. Daily, in the

| Civics Education Goals and Standards—Grades K through 4* | |
|---|---|
| **GOAL** | **SAMPLE STANDARD** |
| 1. What is government and what should it do? | Children should be able to<br>• explain the consequences of the absence of government and of rules and laws; and<br>• explain why limited government is important for the protection of their political rights, e.g., why people serving in limited government must obey laws that prohibit them from unfairly interfering with individual's political rights. |
| 2. What are the basic values and principles of American democracy? | • identify basic documents that set forth shared values, principles, and beliefs, e.g., Declaration of Independence, U.S. Constitution and Bill of Rights, Pledge of Allegiance; and<br>• explain why in a given situation people may differ over which values and principles are most important, e.g., the right of a person to a fair trial and the right to freedom of the press. |
| 3. How does the government established by the Constitution embody the purposes, values, and principles of American democracy? | • explain that the U.S. Constitution is a written document that describes how the government is organized and how power is divided among three branches; and<br>• name the persons representing them at state and national levels in the legislative branches of government. |
| 4. What is the relationship of the United States to other nations and to world affairs? | • explain that the world is divided into many different nations and that each has its own government; and<br>• explain how nations interact through treaties or agreements, e.g., promises to defend each other, agreements to cooperate to protect the environment or to stop the drug trade. |
| 5. What are the roles of the citizen in American democracy? | • explain why citizens of the United States are also citizens of the state in which they live; and<br>• explain contemporary issues regarding personal, political, or economic rights, e.g., school prayer, refusal of medical treatment, employment, welfare, equal pay for equal work. |

* *Excerpted with permission. The full standards provide additional detail.*

democracy of the group, opportunities arise for children to demonstrate respect and assume responsibility for themselves and others. Children have opportunities to lead and to follow, to select leaders, vote, resolve conflicts, and participate to the fullest extent possible in the workings of the group. Dissenting voices, even though they may be in the minority, are accepted and respected.

The social skills and willingness to participate in a democracy do not just happen as if by magic. Just being in a group, while providing the opportunity for social participation, "does not typically include much explicit instruction in social skills or cognitive strategies involved in social participation" (Brophy 1990, 381).

### *Social skills*

Just as children develop personal, embryonic concepts of history and geography, each child has an individual and personal conception of social skills. Because each child understands the world from his or her own unique and egocentric perspective and brings a different background of social experiences and cognitive maturity to the group, there are great differences in the social development of children in any class.

For instance, most 5- and 6-year-olds are very social and self-sufficient. They can plan and carry out activities over a number of days because they have the cognitive maturity to be able to take turns, negotiate,

and cooperate. But this does not mean that all 5- and 6-year-olds get along well with others. Some are assertive and aggressive, others boastful. Others are shy or withdrawn, and still others are most comfortable when they are by themselves.

Becoming a part of a peer group involves maturing, experiencing, and teaching. To guide children in developing social skills, teachers use modeling as well as direct teaching and coaching.

***Modeling.*** "My teacher doesn't do it that way," Vanessa informs her mother. "My teacher makes the letter *T* this way." Children who love their teachers want to be like them and model their behavior. Teachers who respond freely and openly to children's need and who work closely with them find that the children they teach respond to each other more easily (Prescott, Jones, & Kritchevsky 1967; Kemple 1991).

One group of 4-year-olds illustrated the power of modeling. Amy, a child with spina bifida, wore braces and could walk only with crutches. After Amy had been in the class a month or so, the children were observed casually including her in their work and play. Spontaneously and naturally, they would hand her her crutches when she wanted to stand, help her with her coat, and patiently wait for her to join in a play group. The teacher, when complimented on how easily and spontaneously this group of 4s seemed so aware of Amy's needs, said, "Well, it didn't just happen. I used a lot of modeling, but I also explained what and why I was doing certain things, like, 'Holding the chair makes it easier for Amy to get up' or 'Push the crutches to Amy so she can reach them.'" This example illustrates that modeling alone is not sufficient to develop social skills; direct teaching may be needed at the same time.

***Direct teaching.*** Teachers tell or coach children in social skills (Curry & Johnson 1990), for example, "Take these and ask if Alice and Kristin want to help you build a city." A teacher might say, "Ask them if you may have a turn," and when the children reply, "No," the teacher would continue, saying, "OK. Take two more turns, then it's Alberto's turn."

Coaching techniques involve clarifying the skills that must be addressed. The teacher teaches children a specific behavior, discusses why the behavior might work, and then gives children opportunities to put the behavior into practice. As the children practice, teachers ask them to talk about and evaluate their performance (Ramsey 1991).

For example, a child who hits others because she wants to play with a specific toy might be informed that hitting will not help her get what she wants. Together, the child and the teacher may discuss alternative ways of making her wants known. When the child is with others, the teacher can prompt or remind her to use some of the techniques they had discussed. As they practice, the teacher and child talk about the effectiveness of these techniques (Asher & Hymel 1981).

Teachers can also ask children to practice a skill by role playing with dolls or puppets. "These two dolls are playing house, and they won't let your doll play. How will your doll ask if she can play?" Some teachers find that reading books about social problems, such as *Boris Bad Enough* (Kraus 1976), leads to discussions about how children can solve their own problems.

Because respect for the individual is basic to life in a democracy, teachers should never denigrate children when teaching them social skills. The individuality of each child's level of maturity must be respected. Teachers simply and matter-of-factly state the social order—"This is the way we behave here"—and teach children the skills required to become a fully functioning member of the group.

### *Perspective taking*

To give up a measure of one's individuality and consider the needs of the group requires the ability to take the perspective of others. Children's egocentrism is not a matter of their thinking they are better than others, but their cognitive maturity does not permit them to see the world from another's perspective. A child's world is rather like our dreams. In our dreams, we are the major players; we are at the center. If others are present, they revolve around us.

Social studies experiences offer children the opportunity to learn that others also have a unique perspective of the world, one that differs from the children's own. Building an airport out of blocks, discussing time lines they have made, or reading their personal history books to one another can help children consider the perspective of others.

Group experiences, such as field trips, result in ideas, thoughts, and feelings that are individual to each child and are expressed in children's drawings, paintings, constructions, songs, dances, or stories. Teachers encourage children to share these expressions with the group. As each child's unique perception of the same event or experience is made public, children learn that others have ideas or perspectives that differ from their own.

One first-grade class took a trip to a fire station. The following day the teacher provided the children with a variety of art materials that would permit them to express their ideas, thoughts, and feelings about the trip. She did not tell the children what to draw, build, or write about. She supplied yellow and black paints, a variety of papers, pie tins, ropes, and other materials that had the potential of stimulating children to express their ideas about the trip.

Six-year-old Freddy chose to paint at the easel. Over and over again he covered the paper with thick, yellow paint. A group of girls worked together to construct a fire truck. Complete with rope hoses and pie-plate lights, the completed truck was quite realistic.

Following the work period, the teacher asked the group to talk about the things they had made. Freddy showed his all-yellow painting to the group. He said, "This is a picture of the fire station." The girls who had proudly displayed and told how they had constructed the fire truck began to chide Freddy. They said, "That's not the fire station. That's nothing but a yellow piece of paper." Freddy replied, "Yes, it is the fire station. Everything was yellow. The hats were yellow, the coats were yellow, the truck was yellow" (Barbour & Seefeldt 1993).

By giving children a common experience and then providing the opportunity for them to express and defend their own perceptions of the experience to each other, the teacher was promoting the goals of civics education more effectively than the national civics standards have done. As Dewey (1944) wrote, communicating around a common experience is the easiest way of linking an individual with others, of connecting individuals to each other. Without this connection, children might never be able to master the performance standard, "explain why in a given situation people may differ over which values and principles are most important" (CCE 1994, 14).

### *Participating in a democracy*

With a base of social skills and the ability to understand that others have perspectives that may differ from their own but are just as valuable, children have a firm foundation for becoming productive participants in a democracy. From this foundation children learn to assume responsibility for themselves and then for the group.

A group of 3-year-olds demonstrated their ability to solve a group problem. After nearly a month of rain, the children lost control during cleanup time. Instead of putting blocks back on the shelf, children threw them at each other. Two children chased other children around the housekeeping area, trying to capture them with scarves. The children washing out paintbrushes splashed water on anyone who passed by. The group was simply out of control.

The teacher pulled a small chair to the center of the room, sat down, and, as the children ran by, physically caught one or two and motioned to the others until all were seated. She said, "I think we have a problem."

The children chanted together, "We know, we know! We weren't cleaning up."

One said, "We were yelling, and I was running."

Another rather proudly added, "And I splashed water all over Cassandra."

Another child said, shaking her head, "It was a mess."

"Yes," the teacher agreed, "cleanup time today was a mess. And now what are we going to do about it?"

These young children showed that even 3-year-olds can take responsibility for themselves and the group. One child said, "I'll pick up the blocks if Jose will help."

Another conceded, "OK, OK, I'll pick up the clothes."

Soon each child had decided what to do, and together the group put the room back in order. Afterward, at lunch, the children talked about the morning, reflecting on their behavior, still laughing at some of their outrageous behaviors but expressing pride and satisfaction in their ability to solve a problem and work together as a group. These young children could not describe the consequences of absence of government, one of the civics performance standards, but they had experienced the consequences of lack of control and knew how to regain order.

By the time children are in kindergarten and the primary grades, more formal participation in the group is planned. Children experience governing themselves rather than being asked to memorize information about government—"What is government? What does it do?" and so on—as suggested by the national civics standards (CCE 1994, 3). Kindergarten children are able to participate in establishing rules. After a particularly bitter fight had taken place, the teacher called a group meeting. The fight was discussed, and then the teacher said that perhaps if the group established rules and limits, they would not have to spend time settling disputes. She then asked the class what rules they thought they should have. The children listed numerous rules and limits and how they should be enforced. As the teacher continued to write these rules on the chart, one child said, "I know what the rule should be: Just be nice."

The others said, "Yeah, that's the rule we should have: Just be nice."

The teacher wrote "Just Be Nice" on the board. She later made signs displaying the rule and asked children to place them around the room where they thought reminders were necessary. Throughout the year, as disputes arose, she overheard the children saying to each other, "Don't forget our rule: Just be nice."

As children move through the primary grades, they assume at least partial responsibility for rules affecting the entire school, such as helping others, picking up, and not running. By Grade 4, children may have the cognitive maturity to create a government in their own classroom—complete with a written constitution, a class president, officers, and other members of their class government—as well as participate in school councils.

At the same time that children set rules for the group, they may be introduced to the concept of voting. For 4-year-olds, who do not understand the concept of majority and cannot accept losing, experiences

with voting should yield no losers. In these situations children are learning one dimension of the concept of voting—selecting their preferences. In deciding on which game to play, the teacher may ask children to vote for either "Mulberry Bush" or "Looby Loo." Those children voting for "Mulberry Bush" play "Mulberry Bush," and those voting for "Looby Loo" play it. Or children could vote to make and then eat either chocolate or vanilla pudding, spread peanut butter on either crackers or bread, or eat snack either at the table or outside, or they may vote on which books to read, board games to play, or songs to sing. In any case, the teacher would record children's votes, comment on which option the group liked best, and make certain that no child feels as if he or she has lost.

When children are familiar and comfortable with the idea of voting, teachers can use meaningful experiences to introduce the concept of majority and winning. One kindergarten class had equal numbers of boys and girls. Each day when attendance was taken, children observed the gender of the absentees to determine which group was the majority that day. The teacher must select appropriate things for the group to vote on. For example, one kindergarten group nominated names for their two guinea pigs and then voted for the name they liked. Together they counted the votes, and the names with the most votes were given to the guinea pigs.

By first grade, children vote on which field trip to take, who will ask questions of the fire fighter while on the trip, who will present the class visitor with a thank-you gift from the group, or who will represent their class in a school assembly. The teacher must make certain that each child in the class has the opportunity to receive votes. To do this the teacher might specify the people who are to be voted for, saying, "We need two representatives to take our petition about the mess on the playground to the principal. Today you can vote for either Sally, Susie, or Tonja."

### *Can children achieve the civics standards?*

It may be possible, given unlimited amounts of time spent in drill and practice, to train children to recite the contents of the numerous civics standards when queried. By memorizing, instead of learning, children would be able to recite the three branches of government, explain the consequences of absence of government, and name the people representing them at local, state, and national levels, but the children would comprehend little.

The ability to recite the numerous facts in the civics performance standards has little to do with becoming a productive member of a democracy; in fact, it may actually work against achievement of this goal. Research suggests that children who learn civics by rote fail to understand the basic obligations of citizenship in a democratic society; when they become adults, they are more likely to be unable to accept social responsibility or participate in social criticism, and they are more willing to blindly follow—without question—whoever is in power (Hess 1968; Torney-Purta, Oppenheim, & Farnen 1975). It seems wiser and more democratic to respect young children by teaching civics in ways that are congruent with children's development and learning. Children will, after all, learn what they live.

## Use with caution

The geography and civics performance standards, abstract and overwhelming in quantity, do not match children's cognitive development. Young children will fail if asked to master the abstract knowledge required by the performance standards. Failure leads to failure, threatening children's right to learn and to see themselves as capable learners.

In a democratic classroom each child, and the way he or she learns, is respected. The history standards show this respect. Children are not demeaned by being asked to memorize meaningless facts or anything else, whether the names of legislators, states, or cities. Rather, learning experiences in history are grounded in what children already know of their world, as well as designed to challenge and assist children "to 'work on the edge' of their current competence . . . pushing the limits of their current developmental level" (Bredekamp & Rosegrant 1992, 40).

The history standards could serve as a guide for planning and implementing the geography and civics standards, as well as the total early childhood curriculum. The history standards are designed to

- engage children's minds by centering instruction "in the child's immediate present" (NCHS 1994, 4) and then each year reaching out in space and back in time, thus providing curriculum "that is close to the child's experience and therefore more likely to be meaningful" (Bredekamp & Rosegrant 1992, 20).
- meet children's developmental needs and level. "Young children are only in the early stages of acquiring concepts" (NCHS 1994, 3). Rather than being based on a rigid scope and sequence, the guidelines "help children connect new learning to what they already know and are able to do" (Bredekamp & Rosegrant 1992, 20).
- foster the processes of thinking, questioning, seeking and evaluating evidence, and developing attitudes and values, as well as skills. "Curriculum content gives meaning to the process, rather than focusing on isolated facts" (Bredekamp & Rosegrant 1992, 21).

- integrate the curriculum. "History itself is a highly integrative field" (NCHS 1994, 13), touching on economics, geography, the arts, and political, social, and scientific studies. "Children's learning is not compartmentalized or divided into artificial subject-matter distinctions" (Bredekamp & Rosegrant 1992, 20).
- focus on human social, cultural, and political activity. "Social interaction is essential for children to develop real understanding" (Bredekamp & Rosegrant 1992, 21).

Perhaps in the future, early childhood educators and experts from all of the social sciences will be able to work together to determine the basic, most elementary concepts of a given field. Until that time, teachers have the responsibility of answering the questions the geography and civics standards were designed to address: "What should children know, and how will we know they have learned it?"

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# 10 Transforming Physical Education Curriculum

*David L. Gallahue*

***Editors' note:*** *In this chapter, David Gallahue describes the continuum of development and learning in physical education, emphasizing the need for teachers to adapt for individual variation in motor development and learning. The National Association for Sport and Physical Education (1995) published national physical education standards as this book was nearing completion. For readers' information, the national standards are reprinted on pages 128 to 129. Although the national standards are not discussed specifically by the author, Gallahue's description of the continuum of development and learning of fundamental motor skills and his suggestions for appropriate physical education content provide a valuable framework for applying the national standards.*

For young children, movement is at the very center of their lives. Movement influences and is influenced by all facets of development, including motor, cognitive, and affective domains of human behavior. To deny children the opportunity to reap the many benefits of regular vigorous physical activity is to deny them the opportunity to experience the joy of efficient movement, the health benefits of physical activity, and a lifetime as confident, competent movers. No matter what the activity, one cannot take part successfully if the essential fundamental movement skills contained within that activity have not been mastered. Historically, however, the assumption has been made by many that children somehow automatically develop their movement skills, primarily as a result of maturation. Therefore, the portion of the day spent in vigorous physical activity has often been viewed as "free play," "recess," or, at best, a time for children to blow off steam and for teachers and children alike to take a much-needed breather from the "important" teaching and learning activities of the day. Time spent in vigorous movement has often taken the form of a great variety of group games, such as tag and Duck, Duck, Goose. Teachers have not always given serious consideration to using the early years as a time for helping children master their fundamental movement skills, such as running, jumping, throwing, catching, kicking, and balancing.

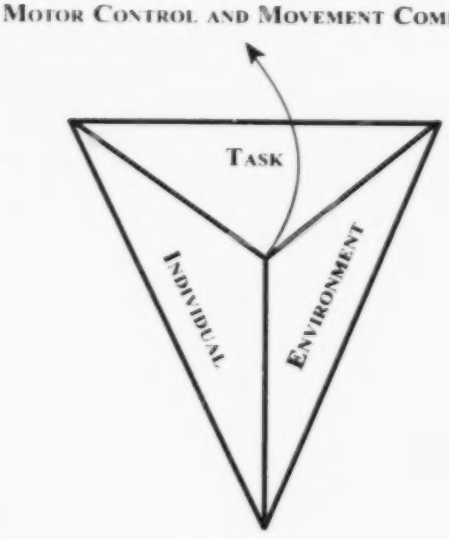
Children's development is frequently studied from a compartmentalized standpoint, focusing on one domain (cognitive, affective, *or* psychomotor) of human behavior to the exclusion of the others. This approach has led to an unbalanced view of the developmental process and the resulting educational practice. It is crucial that people who are interested in the developmental education of young children *not* compound the errors of compartmentalization and, instead, view the child as a total, integrated being (cognitive, affective, *and* psychomotor). In addition to recognizing the vital interactive importance of each domain of human behavior, developmental physical activity recognizes

that there is a complex relationship among the child's biological make-up, his or her unique environmental circumstances, and the specific objectives of the learning task in which the child is engaged (see Figure 1). Such a transactional model implies that factors within the task, the individual, and the environment are all important in the learning process as one strives for motor control and movement competence (Rickard et al. 1995; Gallahue in press).

The assumption that mature fundamental movement skills develop on their own is not valid (Roberton & Halverson 1984; Seefeldt 1986; Gallahue & Ozmun 1995). It is now widely recognized that a variety of factors play a key role in movement skill acquisition and that children need frequent opportunities for practice, positive encouragement, and knowledgeable instruction in an ecologically supportive environment in order to master the fundamental movement skills of childhood. Developmentally based physical activity experiences implemented by knowledgeable and caring adults are essential for young children to develop basic movement skills.

This chapter presents the essential tools for helping children become skillful movers. We begin with a definition of developmental physical education, followed by a brief discussion of the purpose, goals, and objectives of children's physical education. Then we examine what is known about the phases and stages of motor development and the process of movement skill learning. Next we look briefly at the content of the developmentally based physical education curriculum, paying specific attention to movement skill themes and acknowledging that there is more to physical education than having children play Duck, Duck, Goose and the like. Finally, we discuss the topic of assessment from the standpoint of observing children's fundamental movement behavior and consider suggestions for using this important information in curriculum development.

*Figure 1.* REQUIREMENTS OF THE TASK, THE BIOLOGY OF THE INDIVIDUAL, AND THE CONDITIONS OF THE LEARNING ENVIRONMENT INTERACT, AS THE CHILD STRIVES FOR MOTOR CONTROL AND MOVEMENT COMPETENCE




## Developmental physical education: What is it?

Developmental physical education is physical activity that emphasizes the acquisition of sequential movement skills and increased physical competency based on the unique developmental level of the individual. It recognizes and incorporates the many contributions that systematic, sensitive teaching can make to both the cognitive and the affective development of the individual. Developmental physical education encourages the uniqueness of the individual and is based on the fundamental proposition that although motor development is age related, it is *not* age dependent. As a result, teacher decisions concerning what to teach, when to teach it, and how to teach are based primarily on the appropriateness of the activity for the individual and only secondarily on the appropriateness of the activity for a certain age group (NASPE 1992, 1995b).

Although *age-group appropriateness* is an important consideration in the developmental physical education program, the program is not *based on* chronological age or grade level but is *influenced by* both. The process of development proceeds from simple to complex and from general to specific as young children strive to increase their competence in all domains of behavior. As a result, patterns of behavior emerge that help guide us in the selection of movement experiences that are typically appropriate for specific age groups. Some children have special needs that require significant modifications to the program, whereas others can be successfully accommodated through careful attention to the concept of individual appropriateness. Young children are not miniature adults. Their needs, interests, and capabilities are considerably different from those of older children, adolescents, and adults. Likewise, the developmental capabilities, expectations, and appropriateness

### Definition of a Physically Educated Person

A physically educated person

- demonstrates competency in many movement forms and proficiency in a few movement forms;
- applies movement concepts and principles to the learning and development of motor skills;
- exhibits a physically active lifestyle;
- achieves and maintains a health-enhancing level of physical fitness;
- demonstrates responsible personal and social behavior in physical activity settings;
- demonstrates understanding and respect for differences among people in physical activity settings; and
- understands that physical activity provides opportunities for enjoyment, challenge, self-expression, and social interaction.

*From National Association for Sport and Physical Education,* Moving into the Future: National Physical Education Standards: A Guide to Content and Assessment, *1995, 1, Reston, VA: NASPE. (Used with permission)*

of movement activities included in any physical activity program vary considerably among preschool and primary-grade children. While we realize that a child's age is a significant factor in determining the appropriateness of any activity, we must also acknowledge that all children diverge from typically expected age-group patterns of behavior at one time or another.

*Individual appropriateness,* the key concept of developmental education, is based on the central tenet that each child has his or her unique timing and pattern of growth and development. Therefore, the movement activities engaged in by children in developmentally based physical education programs are geared to their stage of motor development and level of movement skill learning. Additionally, the inclusion of specific movement experiences is considerably influenced by personal levels of physical fitness, as well as cognitive and affective development.

The overarching purpose of developmental physical education is to help children become literate movers by *learning to move* and *learning through movement*. A physical education program is *not* a recess or play period. It is, however, a learning laboratory in which knowledgeable, caring adults apply sound principles of child development to reach and teach *each* child. Broadly defined, the concept of literacy may be extended to include the four curricular goals of developmental physical education: movement literacy and fitness literacy (learning to move), as well as cognitive literacy and affective literacy (learning through movement). The box to the left presents the definition of a physically educated person, developed by the National Association for Sport and Physical Education (NASPE 1995c). Characteristics of a physically educated person are the basis of the newly developed physical education standards.

Developmental physical education uses a wide variety of appropriate practices to promote movement skill acquisition and increased physical competence. In addition, developmental physical education recognizes and incorporates the many and varied contributions that sensitive teaching makes to both the cognitive learning and the affective development of children (NASPE 1992). The box below outlines the essential elements of developmentally appropriate physical education curriculum, each of which is compatible with the NAEYC Curriculum Guidelines (NAEYC & NAECS/SDE 1992).

### *The movement and fitness literacy goals (learning to move)*

The learning-to-move aim of developmental physical education is based on the recognition that the primary contributions of physical education lie in the unique goals of movement literacy and fitness literacy. As such, the movement skill objectives of the developmental

### Essential Elements of Developmentally Appropriate Physical Education

Developmentally appropriate physical education must

- focus on the individual appropriateness of developmental movement experiences;
- use age-group appropriateness as a general guideline for activity selection;
- incorporate learning mediums that are both fun and relevant to the needs and interests of the children being served;
- promote inclusion and cooperation, rather than exclusion and competition;
- emphasize moving and learning, rather than sitting, waiting, and watching;
- promote individual standards of success and achievement, and minimize failure; and
- recognize that young children are not miniature adults, adolescents, or older children but have unique and differing needs, interests, and developmental capabilities.

| Standards for Physical Education—Grade K* | |
|---|---|
| ***Content Standard*** | ***Assessment Guide*** |
| A physically educated person | The emphasis for the kindergartner will be to |
| 1. demonstrates competency in many movement forms and proficiency in a few movement forms | • demonstrate progress toward the mature form of selected manipulative, locomotor, and nonlocomotor skills; and<br>• demonstrate mature form in walking and running. |
| 2. applies movement concepts and principles to the learning and development of motor skills | • identify fundamental movement patterns (skip, strike);<br>• establish a beginning movement vocabulary (e.g., personal space, high/low levels, fast/slow speed, light/heavy weights, balance, twist); and<br>• apply appropriate concepts to performance (e.g., change direction while running). |
| 3. exhibits a physically active lifestyle | • engage in moderate to vigorous physical activity;<br>• select and participate in activities that require some physical exertion during unscheduled times; and<br>• identify likes and dislikes connected with participation in physical activity. |
| 4. achieves and maintains a health-enhancing level of physical fitness | • sustain moderate to vigorous physical activity for short periods of time; and<br>• identify the physiological signs of moderate physical activity (e.g., fast heart rate, heavy breathing). |
| 5. demonstrates responsible personal and social behavior in physical activity settings | • apply, with teacher reinforcement, classroom rules and procedures and safe practices; and<br>• share space and equipment with others. |
| 6. demonstrates understanding and respect for differences among people in physical activity settings | • recognize the joy of shared play; and<br>• interact positively with classmates regardless of personal differences (e.g., race, gender, disability). |
| 7. understands that physical activity provides the opportunity for enjoyment, challenge, self-expression, and social interaction | • engage in physical activities;<br>• associate positive feelings with participation in physical activity; and<br>• try new movement activities and skills. |

* *Excerpted with permission. The full standards provide additional detail.*

| Standards for Physical Education—Grade 2 | |
|---|---|
| ***Content Standard*** | ***Assessment Guide*** |
| A physically educated person | The emphasis for the second-grader will be to |
| **1.** demonstrates competency in many movement forms and proficiency in a few movement forms | • demonstrate mature form in skipping, hopping, galloping, and sliding;<br>• demonstrate mature motor patterns in simple combinations (e.g., dribbling while running);<br>• demonstrate smooth transitions between sequential motor skills (e.g., running into a jump);<br>• exhibit the ability to adapt and adjust movement skills to uncomplicated, yet changing, environmental conditions and expectations (e.g., tossing a ball to a moving partner, rising and sinking while twisting, using different rhythms); and<br>• demonstrate control in traveling activities and weight-bearing and balance activities on a variety of body parts. |
| **2.** applies movement concepts and principles to the learning and development of motor skills | • identify the critical elements of basic movement patterns;<br>• apply movement concepts to a variety of basic skills; and<br>• use feedback to improve performance. |
| **3.** exhibits a physically active lifestyle | • experience and express pleasure from participation in physical activity;<br>• engage in moderate to vigorous physical activity outside of physical education class; and<br>• identify at least one activity associated with each component of health-related physical activity. |
| **4.** achieves and maintains a health-enhancing level of physical fitness | • engage in sustained physical activity that causes an increased heart rate and heavy breathing;<br>• recognize the physiological indicators that accompany moderate to vigorous physical activity (e.g., sweating, increased heart rate, heavy breathing); and<br>• identify the components of health-related physical fitness. |
| **5.** demonstrates responsible personal and social behavior in physical activity settings | • apply rules, procedures, and safe practices with little or no reinforcement;<br>• follow directions; and<br>• work cooperatively with another to complete an assigned task. |
| **6.** demonstrates understanding and respect for differences among people in physical activity settings | • play and cooperate with others regardless of personal differences (e.g., gender, ethnicity, disability);<br>• treat others with respect during play; and<br>• resolve conflicts in socially acceptable ways. |
| **7.** understands that physical activity provides the opportunity for enjoyment, challenge, self-expression, and social interaction | • gain competence to provide increased enjoyment in movement;<br>• try new activities;<br>• express feelings about and during physical activity; and<br>• enjoy interaction with friends through physical activity. |

* *Excerpted with permission. The full standards provide additional detail.*

program center on helping young children become skillful, knowledgeable, and expressive movers with a wide variety of fundamental movement skills. The fitness enhancement goal of developmental physical education strives to help children become fit, informed, and eager movers by promoting an active way of life.

For example, young children become skillful movers as they learn to move with control and efficiency in the performance of their fundamental movement skills. Learning how to run and leap, throw and catch, and balance and roll helps them develop the basic movement skills essential for an active lifestyle. Likewise, they become knowledgeable movers as they learn more about the movement concepts of how their bodies *can* move and the skill concepts of how they *should* move. Knowing the many and varied ways that their bodies can move through space and the essential elements of how they should move when they jump rope or play hopscotch provides them with important knowledge for further movement skill acquisition and refinement. Through movement, children also become expressive movers. Expressive movers are capable of moving creatively and of appreciating the beauty of movement in themselves and others. Such appreciation is self-motivating, promotes active involvement, and fosters a need for creative movement expression.

Additionally, as young children achieve the goal of movement skill acquisition, they are also becoming fit movers. Fit movers maintain a personal level of physical fitness and enjoy the many positive health benefits of vigorous physical activity. Fit movers also need to be informed movers who learn about essential fitness concepts and sound principles for gaining and maintaining a personal level of fitness. Such knowledge provides them with the keys to a lifetime of fitness education. Through quality activity experiences children maintain their natural zest for being eager movers. As a result, they are self-motivated to engage in positive fitness behaviors as part of a personally chosen, active way of life.

### *The cognitive and affective literacy goals (learning through movement)*

The learning-through-movement aim of developmental physical education is based on the realization that, through good teaching, movement can make significant contributions to other areas of development and learning, especially cognitive and affective literacy. Adults can aid children's cognitive learning by helping them achieve the important objectives of being multisensory and active learners. Similarly, adults can enhance children's affective development by helping them become self-discovering, cooperative learners. For example, children maximize their effectiveness as multisensory learners when they use their tactile and kinesthetic (bodily) senses as avenues for learning, in addition to the visual and auditory modes more commonly used in the classroom. Because they are naturally active learners, children use physical activity effectively to gather and apply information about their ever-expanding world. Young children's skill as active learners needs to be recognized and nurtured through learning media that both permit and promote physical activity.

Children become self-discovering learners, building self-confidence and enhancing self-esteem, as they increase their movement competence through play, games, and vigorous physical activity. Additionally, developmental movement experiences help them become cooperative learners as they learn how to share equipment, take turns, and play fair. Figure 2 provides an overview of the goals and objectives of developmental physical education.

***Figure 2.*** **Movement Literacy Goals and Objectives of Developmental Physical Education**

| *Goals* | *Objectives* |
|---|---|
| Movement literacy | Skillful movers<br>Knowledgeable movers<br>Expressive movers |
| Fitness literacy | Fit movers<br>Informed movers<br>Eager movers |
| Cognitive literacy | Active learners<br>Multisensory learners |
| Affective literacy | Cooperative learners<br>Self-discovering learners |

## The categories of movement

Movement skills may be subdivided into categories. A category of movement is a classification scheme based on common underlying components. As used here, the terms *locomotion*, *manipulation*, and *stabil-*

*ity* represent these underlying components. These three categories and resulting movement phrases serve as the organizing centers of the movement skill themes of the developmental physical education curriculum (see Figure 3).

*Locomotor movements* are those in which the body is transported in a horizontal or vertical direction from one point in space to another. Running, jumping, hopping, leaping, and skipping are all fundamental locomotor movements.

*Gross motor manipulative movements* are vigorous movements that involve giving force to objects or receiving force from objects. Throwing, catching, kicking, trapping, and striking are fundamental gross motor manipulative skills.

*Fine motor manipulative movements* involve object-handling activities that emphasize motor control, precision, and accuracy of movement. Tying shoes, coloring, and cutting with scissors are all fundamental fine motor manipulative skills.

*Stability movements* are activities in which the body remains in place but moves around its horizontal or vertical axis. They also include dynamic balance tasks, in which a premium is placed on gaining or maintaining balance in relationship to the force of gravity. A forward roll and dodging a ball are both considered to be stability activities because of the strong emphasis placed on maintaining equilibrium throughout the task. Axial movements, such as reaching, twisting, turning, bending, and stretching, along with lifting, carrying, pushing, and pulling, are also fundamental stability activities.

*Movement phrases* are combinations of locomotor, manipulative, and/or stability movements. Movement phrases are introduced only after children have mastered the basic elements of a single fundamental movement skill. For example, rather than being content with jumping off a box and landing in a bent-knee position, children reach a level of skill at which they may want to jump off, land, and do a forward roll. Or they may want to jump with a half turn followed by a backward roll. As children's skill develops, these movement phrases become longer, more complex, and more refined.

***Figure 3.*** **CATEGORIES OF MOVEMENT AND SAMPLE MOVEMENT SKILL THEMES OF THE DEVELOPMENTAL PHYSICAL EDUCATION CURRICULUM**

| Selected Fundamental Movement Skill Themes | | |
|---|---|---|
| ***LOCOMOTION*** | ***MANIPULATION*** | ***STABILITY*** |
| Basic (one element):<br>a. Walking<br>b. Running<br>c. Leaping<br>d. Jumping<br>e. Hopping | Propulsive:<br>a. Throwing<br>b. Kicking<br>c. Punting<br>d. Striking<br>e. Volleying<br>f. Bouncing<br>g. Rolling | Axial:<br>a. Bending<br>b. Stretching<br>c. Twisting<br>d. Turning<br>e. Swinging |
| Combinations (two or more elements):<br>a. Galloping<br>b. Sliding<br>c. Skipping<br>d. Climbing | Absorptive:<br>a. Catching<br>b. Trapping | Static and dynamic postures:<br>a. Upright balancing<br>b. Inverted balancing<br>c. Rolling<br>d. Starting<br>e. Stopping<br>f. Dodging |

## Phases and stages of motor development

The acquisition of movement skills occurs in phases and stages (Seefeldt 1986; Gallahue & Ozmun 1995). During infancy children pass through the reflexive movement phase and the rudimentary movement phase. The reflexive phase begins prior to birth and is characterized by involuntary movements that dominate the actions of the young infant. As higher brain centers take over, the rudimentary movements associated with gaining voluntary motor control in such things as reaching for, grasping, and releasing objects, and crawling, and basic walking mature. The period ranging from about 2 to 7 years of age is generally considered to be the fundamental movement phase, the ideal time for children to master basic locomotor, manipulative, and stability skills. These movement skills develop along a continuum of stages within this phase, progressing from the initial to the elementary to

the mature stage. During later childhood and adolescence, children are typically at the specialized movement phase of development. At the specialized phase, fundamental movements are combined, refined, and applied to a wide variety of more complex movement tasks. Figure 4 provides a visual representation of the phases and stages of motor development.

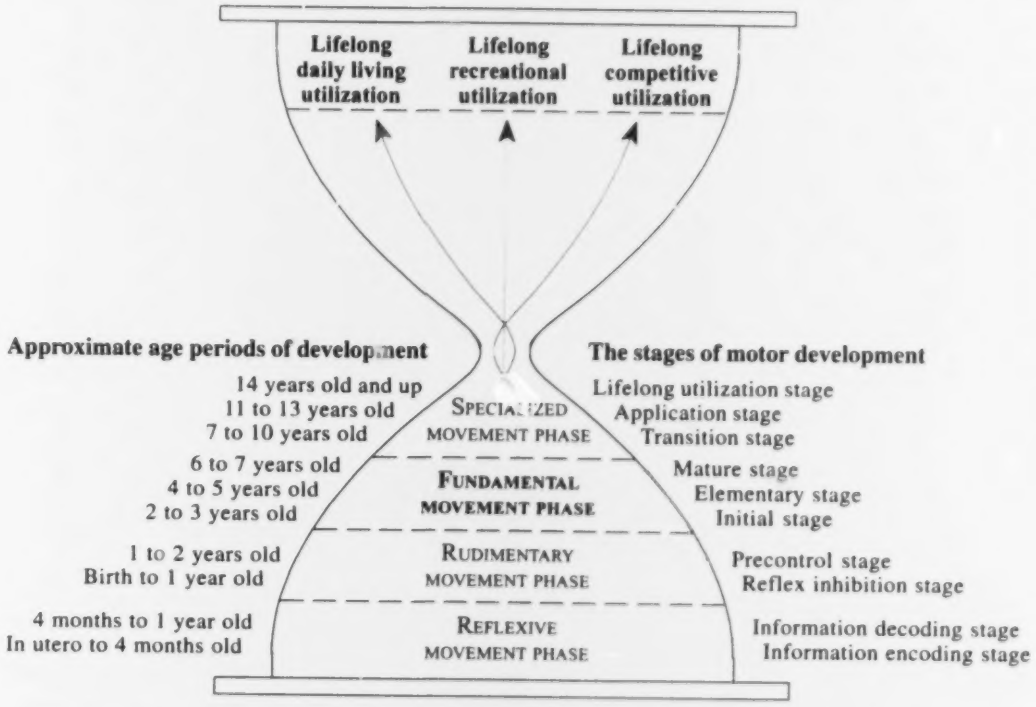
For any given type of movement task, the specific requirements of the task, the biology of the individual, and the conditions of the environment all interact to determine the rate and extent of development in the motor domain. The process of motor development is heavily influenced by biology and is therefore hierarchical and sequential during the reflexive and rudimentary phases of development. From that point onward, however, the specific requirement of the movement task coupled with a variety of environmental conditions determine what movement skills will be learned and the extent to which they will be mastered. In other words, we cannot depend solely on physical maturation to bring about mature patterns of fundamental movement skills. Only through sufficient opportunities for practice, positive encouragement, and thoughtful instruction in an ecologically sound learning environment can we ensure that children will master the fundamental movement skills of early childhood that form the basis for the specialized skills of later childhood and beyond.

This discussion focuses on the initial, elementary, and mature stages within the fundamental movement phase because these are the developmental tasks of the period from ages 2 through 8.

### *Initial stage*

At the initial stage of developing a fundamental movement skill, children make their first observable and purposeful attempts at performing the task. Two- and 3-year-olds typically function at the initial stage, which is characterized by relatively crude, uncoordinated movements. Children at this age make valid attempts at throwing, catching, kicking, jumping, and so forth, but major components of the mature pattern are missing. Movements are either grossly exagger-

***Figure 4.*** **PHASES AND STAGES OF MOTOR DEVELOPMENT**




*From D.L. Gallahue & J.C. Ozmun,* Understanding Motor Development: Infants, Children, Adolescents, Adults, *1995, 83, Dubuque, IA: Brown & Benchmark. (Used with permission)*

ated or inhibited, and rhythmically coordinated execution of the movement is also absent. Teachers of children at the initial stage must recognize that this is a legitimate stage of development and that the normal vigorous indoor and outdoor play experiences of childhood will do much to help young children progress to the elementary stage.

### *Elementary stage*

The elementary stage of fundamental movement skill development is typically seen in the performance of 4- and 5-year-olds. This is a transitional period between the initial and the mature stage, in which coordination and rhythmical performance improve and children gain greater control over their movements. However, movements at the elementary stage still appear somewhat awkward and lacking in fluidity. Many adults are only at the elementary stage in such basic activities as throwing, striking, and catching; they progressed to this stage primarily through maturation but failed to achieve the mature stage because of inadequate environmental conditions.

Teachers of preschool and kindergarten children who are at the elementary stage must provide these children with ample encouragement and opportunities for practice. A well-designed play environment with plenty of equipment and interested adults to stimulate locomotor, manipulative, and stability skill development will do much to establish the environmental conditions that children so vitally need to advance to the next stage of movement skill development. Equally important at this stage is the need for quality instruction. Teachers need to be actively involved in helping children learn to move. By challenging them through teaching approaches that involve movement exploration and guided discovery experiences, teachers help children to progress from the elementary to the mature stage.

### *Mature stage*

By age 6 or 7, children generally have the developmental potential to be at the mature stage in most fundamental movement skills, with the exception of manipulation skills that involve object tracking, such as hitting a pitched ball or volleying a ball. But because environment is such an important factor in mature movement skill acquisition, many children are delayed in their attainment or miss out altogether. The mature stage of fundamental movement skill development is characterized by integration of all the component parts of a pattern of movement into a well-coordinated, mechanically correct, efficient act that is appropriate to the demands of the task. From this stage, performance improves rapidly. Children are, for example, able to throw farther, run faster, and jump higher once they attain the mature stage. A mature fundamental skill may be continually refined, combined with other movement skills, and used in a variety of sport and recreational activities.

***WE CANNOT DEPEND SOLELY ON PHYSICAL MATURATION TO BRING ABOUT MATURE PATTERNS OF FUNDAMENTAL MOVEMENT SKILLS.***

Children reach the mature stage at varying rates. Some children may be delayed in reaching this stage; others may be advanced and reach this stage more rapidly. If skill development is delayed over a period of years, some skills may never be attained in their mature form without considerable extra effort.

Teachers of children at the mature stage must focus more on the product of the child's performance than on the process. Teachers should begin to introduce qualitative standards of how far, how fast, or how many. Mature fundamental movement skills form the basis for the specialized movement skills that individuals need to enjoy the sport and recreational activities of our culture.

## How movement skills are learned

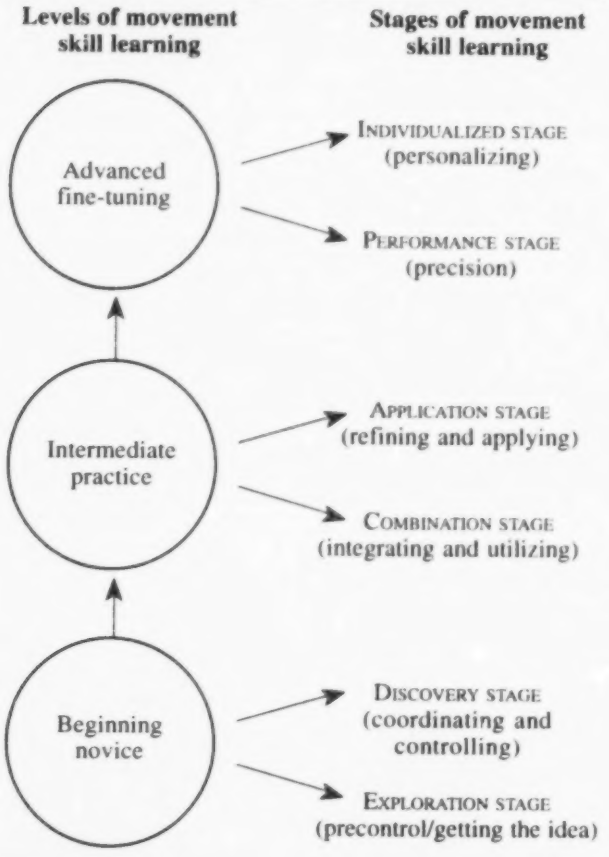
*Learning* is frequently viewed as a relatively permanent change in behavior. *Movement skill learning,* therefore, may be defined as a change in motor behavior resulting in improved movement performance. The actual learning of a new movement skill is an internal process that can be observed only indirectly through the product of one's movement. Unfortunately, movement skill learning is sometimes viewed simply as the product of some form of activity designed to improve children's motor performance, with little attention given to the processes involved. Such a view is incomplete and limited in scope. Learning is a process that frequently occurs within the individual through the reconstruction of incorrect mastery attempts. As one moves from an uncoordinated and poorly controlled movement to a highly refined, coordinated, and controlled performance, the process of learning is occurring, which eventually results in the finished product: the movement performance.

The NAEYC and NAECS/SDE Curriculum Guidelines describe learning as a cycle occurring in stages of cognitive concept learning, identified as awareness, exploration, inquiry, and utilization (1992; this volume, pp.19–21). This cycle is similar to what occurs

in the process of movement skill learning. Learning a new movement skill also involves a hierarchical process. This sequential progression in learning a new movement skill has been classified into broad levels and substages (Magill 1993; Gallahue & Ozmun 1995; Gallahue in press), and although the various writers use different terminology, the content of these stages is remarkably similar. Each level (beginning, intermediate, and advanced) and stage (exploration, discovery, combination, application, performance, and individualization) (Gallahue in press) refers to a period during which the learner displays specific characteristics and the teacher has specific responsibilities in order to maximize learning. Figure 5 provides a visual representation of these levels and their corresponding stages. The process of movement skill learning, although described in somewhat different terminology, occurs in stages congruent with the cycle of learning described by NAEYC and NAECS/SDE on pages 19 to 21 of this volume.

The process of learning a new movement skill is the same, regardless of the age of the learner. Children and adults go through the same processes when learning a new movement skill, whether learning to successfully ride a tricycle or learning to drive a car. For example, when learning to ride a tricycle, young children first develop a general *awareness* of what is involved in the process of tricycle riding. Then, through *exploration*, they experiment with the essential elements of balancing, peddling, and steering. Soon, through systematic *inquiry*, they discover how to successfully ride the tricycle. Gradually they become more adept in the *utilization* of their newly learned tricycling skills. Through continued practice, their performance improves and their tricycling skill becomes more refined. Soon these skills are applied in a variety of settings and terrains with ease. With further effort, skillful young tricycle riders become capable of precise performances on hills, around corners, and through obstacle courses and mazes on the playground. The children are then capable of individualizing and personalizing their tricycle-riding performance to their individual needs and interests as they utilize their highly developed skills for both fun and fitness.

***Figure 5.*** **Levels and Stages of Learning a New Movement Skill**




*Adapted from D.L. Gallahue & J.C. Ozmun,* Understanding Motor Development: Infants, Children, Adolescents, Adults, *1995, Dubuque, IA: Brown & Benchmark. (Used with permission)*

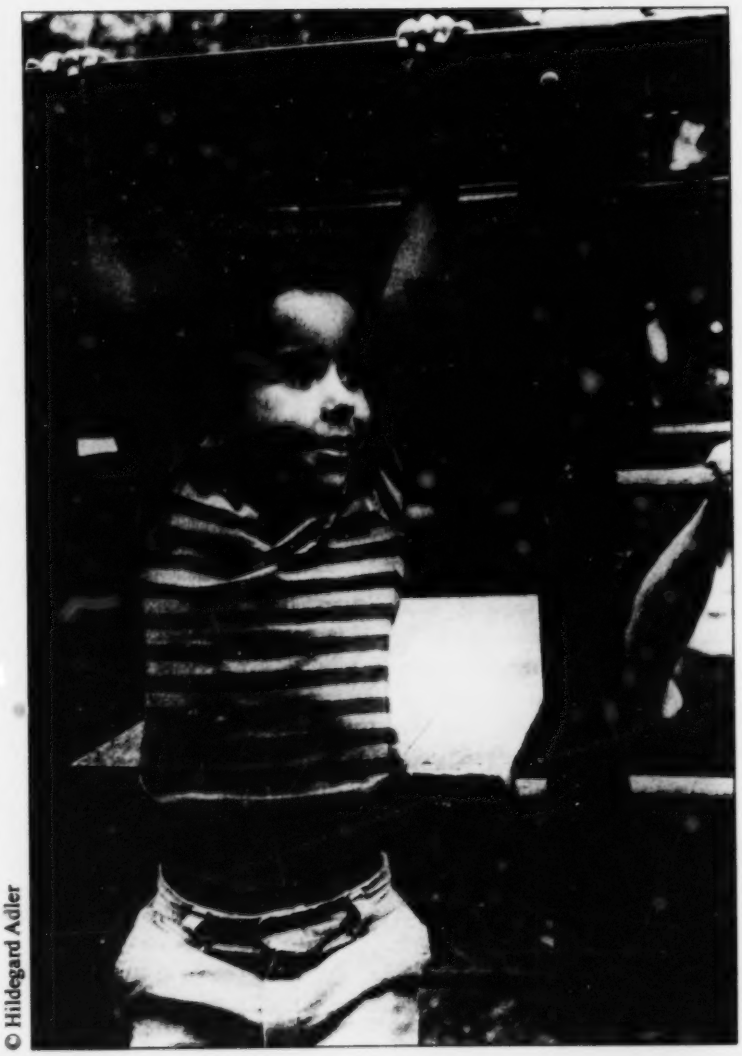
## *Beginning/novice level*

The beginning, or novice, level of learning a new movement skill is a precontrol level in which the child is trying to get a general idea of the requirements of the movement task. There is considerable variability in performance, with many gross errors. At this level, performing the movement is a conscious cognitive process, in which the child pays attention to each detail of the task, without regard to its relative importance. Movement control and coordination is lacking, and the learner frequently becomes easily fatigued because of the mental requirements of the task. Teachers of children at the beginning level of learning a new movement skill must be aware of the conscious cognitive requirements of this level and understand that their task is only to provide the learner with the general idea of the skill or activity.

***Exploratory stage.*** Exploration is the first stage within the beginning/novice level. At this stage the child develops awareness of the general characteristics of the movement task and begins to experiment with it in relative isolation from other movement skills. At the exploratory stage of learning how to throw a ball, for example, a child lacks movement con-

trol but is forming a conscious mental plan and getting the general idea of what is required for a successful throw. Movement exploration techniques that permit the child to experiment with the many and varied ways of throwing a ball are especially beneficial in helping the child get a general idea of how the body can move in the performance of the task.

***Discovery stage.*** At the discovery stage of learning a new movement skill, the child begins to find more efficient ways and means of performing the task. In terms of ball throwing, a child's movement control and coordination begin to improve and become less consciously controlled. Guided discovery and problem-solving techniques are helpful at this stage for children to sort out the important from the unimportant in beginning to coordinate and control how the body should move in the performance of the overhand throwing pattern.



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### *Intermediate/practice level*

The intermediate, or practice, level of learning a new movement skill begins after a child obtains the general idea of the skill and is able to perform it in a manner approximating the final skill. The learner at this level has a better understanding of the skill, and a mental plan becomes more fully developed. The child has sufficient knowledge of both how the body can move and how it should move in the performance of the task, but consistency is still lacking. The skill at this level has utility and is practiced repeatedly. Conscious attention to the elements of the task diminishes. The child now devotes more attention to the goal or product of the skill than to the process itself. The poorly coordinated, jerky movements so evident at the beginning level disappear. The learner gains a "feel" for the skill as her kinesthetic sensitivity becomes more highly attuned. As a result, she relies less on verbal and visual cues and more on muscle sense.

***Combination stage.*** At the combination stage of learning a new movement skill, the child begins to join the actions of one movement skill with those of other movement skills. This is a practice stage in which the child combines and integrates the new movement skill with other previously learned skills and practices repeatedly in her first attempts to utilize it in some activity form, such as a game, rhythm, or self-testing activity. For example, the child can now perform the overhand throw from a variety of positions instead of relying only on the classic overhand-throwing preparatory stance. At the combination stage the child learns to throw on the run or to bend over and recover a ground ball immediately prior to throwing the ball to a partner.

***Application stage.*** When the child reaches the application stage, she pays more attention to refining the movement skill and applying it as a specialized movement skill to some form of recreational or introductory sport related activity. She works on smoothing out the task through further practice and using the skill in an applied sense. Our ball thrower, for example, now applies her overhand-throwing skills in a variety of throwing games.

### *Advanced/fine-tuning level*

The advanced, or fine-tuning, level is the third and final level in learning a movement skill. The learner at this level has a complete understanding of the skill. Her mental plan for the skill is highly developed, and she pays very little attention to the cognitive aspects of the task. In fact, individuals at this level often have difficulty describing how they perform the activity. They often resort to a "let me show you" or a "do it like this" statement, followed by actual performance of the skill. The learner at this level is refining and fine-tuning her skills. She presents a general appearance of ease, mastery, and total control and is able to tune out irrelevant information and not be bothered by distractions. She displays excellent timing and anticipation of movements, and her action appears to be automatic, although in reality it is a finely tuned skill requiring only minimum conscious control.

***Performance stage.*** At this stage in the movement skill learning process, the learner is further involved in refining the elements of the movement task but with emphasis on utilizing it in a variety of performance situations. Precision and utilization of the skill in a variety of settings ranging from game, dance, and recreational activities to a variety of youth sport experiences are stressed at this stage. For example, our ball thrower now combines her ball-throwing skills with catching, batting, and base running to play the game of baseball on a local youth sport team.

***Individualized stage.*** Although young children are seldom at this stage, learners at the individualized stage in the movement skill learning hierarchy are personalizing their performances. They make fine-tuning adjustments and modifications in execution of the specific task in accordance with individual needs. The learner makes personalized performance assessments to take advantage of individual strengths or limitations in the performance of the task.

## Moving beyond Duck, Duck, Goose

Traditionally popular with young children has been the chasing-and-fleeing game, Duck, Duck, Goose. Children sit in a circle. One child, who has been chosen to be "It," walks around the outside of the circle, saying "Duck" as he taps each child. He chooses to call one child "Goose," and this child chases him around the circle, trying to tag him before he reaches the spot left vacant by the goose. If "It" reaches the empty spot without being tagged, the goose becomes "It." Games of the Duck, Duck, Goose type have value for social and cognitive development, but they contribute little to children's acquisition of movement skills because children spend most of their time waiting to be tapped or sitting out after being eliminated from the game. The physical education experiences of children must be developmentally appropriate and educationally justifiable to be included in the total curriculum package for young children.

If the physical education curriculum no longer centers around games like Duck, Duck, Goose, what is to have their place? A program of developmentally appropriate movement experiences that emphasizes a variety of fundamental locomotor, manipulative, and stability movement skill themes. A skill theme curriculum focuses on movement skill acquisition that also incorporates important program strands designed to achieve the goals of fitness enhancement, cognitive learning, and affective development (Graham, Holt-Hale, & Parker 1993; Gallahue in press). The box below illustrates the premises upon which developmentally appropriate practices for young children are based that have been adopted by the Council on Physical Education for Children (NASPE 1995a). These premises, coupled with appropriate entry-level assessment techniques described later in this chapter, provide a starting point for choosing appropriate movement experiences. If teachers know where children are in their fundamental movement skill acquisition, then it becomes a relatively easy matter to formulate educationally valid and developmentally appropriate movement experiences that go far beyond Duck, Duck, Goose.

### Premises of Movement Programs for Young Children

- Three-, 4-, and 5-year-old children are different from elementary school–age children in terms of their motor control and movement competences, as well as their needs and interests.
- Young children learn through integration with their environment.
- Teachers of young children are guides or facilitators.
- Young children learn and develop in an integrated fashion.
- Planned movement experiences enhance play experiences.

## The teacher's role

Each level in the process of motor development and movement skill learning requires knowledgeable, sensitive guidance by qualified teachers. Teachers must understand the characteristics of the learner to structure the time spent in physical education for maximum learning. Acquiring skill in movement takes time. Unfortunately, the teacher of young children frequently does not have time set aside for instructional physical education. Organized, high-quality instructional sessions geared to the movement skill level and the developmental level of the learner are crucial to realizing children's potential in learning to move and learning through movement. Free play is insufficient, as are the group games that children play, valuable as these are for their social and cognitive development. Teachers of young children must identify both the children's developmental level and their level of movement skill learning in order to plan appropriate educational experiences.

For example, 2-, 3-, and 4-year-olds are typically at the beginning level of learning numerous fundamental movement skills and at the initial stage within the fundamental movement phase. Creating an atmosphere conducive to learning that is in harmony with their being at the exploratory and discovery stages is essential. The atmosphere should help children develop a general awareness of the essential elements of fundamental movement skills and provide ample opportunity for movement exploration and self-discovery. Teachers can create this kind of atmosphere by using problem-solving and movement-challenge techniques that ask leading questions or make statements such as "Who can . . . ?" "How many ways can you . . . ?" "See if you can . . . ," or "Let's try . . . ." The objective of the teacher of children at this level should be to develop an awareness of the movement skill and to permit exploration, experimentation, and self-discovery of general aspects of the task.

Children at the intermediate/practice level of learning new fundamental movement skills are typically 4-, 5-, and 6-year-olds who are also at the elementary stage in the fundamental movement phase of development. Teachers of children at this intermediate level should recognize that children have the general idea of movement and should focus on skill enhancement through practice. Practice sessions should promote skill refinement and maximize learner feedback. Teaching techniques that focus on refining the skill and applying it with success to a variety of play and cooperative game activities are especially helpful at this stage.

Children are sometimes at the fine-tuning level in some fundamental movement skills by ages 6, 7, and 8 and are therefore at the mature stage in the fundamental movement phase. The abundance of youth sport opportunities, coupled with children's tremendous surge of interest in sport during this period, accounts for the need to have mature patterns of fundamental movement that can be applied to sports and increasingly demanding recreational activities. Using a variety of teaching styles is especially helpful at this stage, with particular attention on knowing the learner as an individual and maximizing individual performances.

### *Teaching styles*

A variety of teaching styles may be effectively used in the developmental physical education program. A teaching style is a specific set of decisions made by the instructor to achieve the learning objectives of the lesson, resulting in identifiable behaviors on the part of the teacher. Selecting an appropriate teaching style to use in a lesson should not be a matter left to chance. Instead, prior to using a specific style, the teacher should consider a variety of learning factors concerning the children and their environment. Use of a specific teaching style should be determined by the children's motor development and movement skill learning. Teachers sensitive to the needs, interests, and developmental level of their students also carefully consider the environmental conditions and task complexity prior to selecting a teaching style. The box below lists critical factors to take into account when selecting an appropriate teaching style for the movement lesson.

The act of teaching is governed by decision making—decisions about the learner, the movement task itself, and the environment in which the task is to be learned (Mosston & Ashworth 1994). *Indirect teaching styles* focus on methods of teaching that put the child at the center of the learning process. Child-centered methods are based on the philosophy that learning is more than the reproduction and modeling of mechanically

**Factors to Consider When Selecting a Teaching Style**

- Phase and stage of motor development
- Level of movement skill learning
- Ability to handle the task complexity
- Comprehension of the task
- Behavioral ability to comply

"correct" movement behaviors. Proponents of child-centered methods believe that learning to learn through experimentation, problem solving, and self-discovery is essential to any "real" learning. Indirect teaching styles are grounded in cognitive learning theory, which holds that learning is an internal process that occurs from the inside-out through incorrect mastery attempts, and that the process of learning is equally as important as the product (Peterson & Felton-Collins 1986).

The key to the effective use of any indirect teaching style is the thoughtful construction and use of movement challenges that allow for a variety of interpretations but still remain within the confines of the stated lesson objectives. The primary advantages of indirect styles are that they permit the child greater involvement in the learning process and that they recognize individual differences among children by permitting them to solve movement problems presented to them. With no one "best" way to perform, all children work at their own level of ability and experience some degree of success. Indirect styles allow children to develop a movement "vocabulary" (because they are focused on a process of learning that emphasizes exploration, experimentation, and self-direction in their learning attempts). They also learn to express themselves creatively and to think and develop self-direction in their thinking and problem solving.

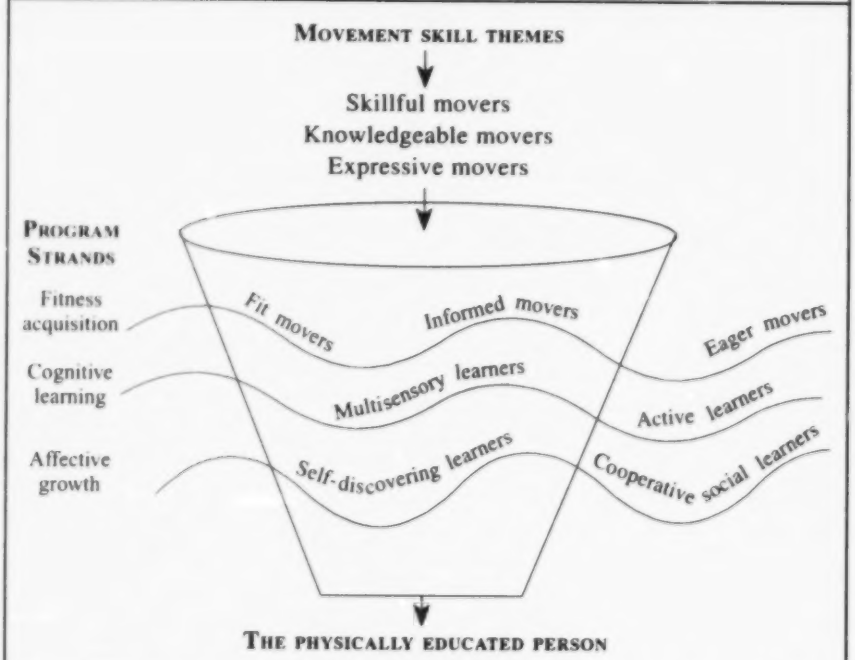
### *Planning movement skill themes and program strands*

The developmental physical education program utilizes a movement skill theme approach as the primary vehicle for promoting learning. A movement skill theme is a series of activities that focus on one or more related movement skills, with the intent of helping children progressively improve their movement competence in a manner that is both age-group appropriate and developmentally appropriate for individual children. The thematic approach to curriculum content has become popular in recent years in many curricular areas, including physical education (Gabbard, LeBlanc, & Lowy 1987; Graham, Holt-Hale, & Parker 1993; Gallahue in press). Important fitness, cognitive, and affective learning strands run through each skill theme. These strands are of continuing importance and emphasis throughout the curriculum and are achieved through the movement skill themes. Figure 6 provides a visual representation of the skill-theme approach to developmental physical education.

A movement skill theme addresses a movement skill or group of related movement skills upon which a series of lessons is based with the specific objective of developing skillful, knowledgeable, and expressive movers. Rather than centering on an isolated content area (games, dance, or self-testing activities), as in the traditional curriculum, or on a movement concept (effort, space, or relationships), as in the movement education curriculum, movement skill themes center on specific movement skills that are to be developed and refined as the major focus of the lesson. Activities from the various content areas and movement concepts are incorporated into this approach.

For example, children who are at the fundamental movement phase of development may take part in a series of lessons designed to advance them to a more mature stage in running, jumping, throwing, or catching.

***Figure 6.*** **THE SKILL THEME AND PROGRAM STRAND APPROACH**




*From D.L. Gallahue,* Developmental Physical Education for Today's Children, *In press, 10, Dubuque, IA: Brown & Benchmark. (Used with permission)*

The children play games, dance dances, and explore the concepts of movement education to achieve the curricular goals of movement skill acquisition, fitness enhancement, cognitive learning, and affective development.

## Assessing progress

An important aspect of any sound educational program is assessment. Assessment provides teachers with a measure of children's current level of ability and their progress over time. *Motor assessment* is the collection of relevant performance information for making reliable determinations of a child's present personal level of functioning.

By assessing a child's current status, the teacher obtains a baseline or yardstick by which to measure the child's progress. *Entry-level assessment,* or *formative assessment,* can be easily and quickly done at the very beginning of a new skill theme. With this information in hand, the teacher can develop a series of lessons based on where children *are* rather than where they should be. Entry-level assessment permits the instructor to fit the program to the needs of the child rather than fitting the child to a predetermined program.

Assessment serves a second vital function: measuring progress over time. Through *exit-level assessment,* or *summative assessment,* the teacher can evaluate progress at the end of a skill theme. If the operational philosophy centers on the goal of individual improvement, then a combination of entry-level assessment ratings with exit-level assessment is needed.

With regard to developing and refining children's movement, assessment at *both* the beginning and the end of a skill theme is highly recommended. Master teachers continually assess their students through both informal and formal means. They constantly make adjustments and revisions in their lessons to facilitate learning. Two forms of assessment are appropriate and available: *process assessment* and *product assessment*. Both may be used, depending on the level of children's ability, the specific needs of the children and the teacher, and the amount of available time.

### *Process (observational) assessment*

*Process assessment,* or *observational assessment,* is concerned with the form, style, or mechanics used to perform a movement skill. When focusing on the movement process, teachers are not concerned with the product of the act, such as how far the ball travels, how many baskets the child makes, or how fast the child runs the 50-yard dash. Instead, the teacher is concerned primarily with the body mechanics used to throw the ball, make the basket, or run the dash. Observational assessment is an effective subjective technique for knowledgeable teachers to use, especially when the primary goal is to teach people how to move. Concern for the proper mechanics, or the process of movement, must occur before focusing on the product.

The assessment approach advocated here recommends that for children at the fundamental movement phase of skill development, we assess whether they are at the *initial, elementary, mature,* or *specialized skill* stage. It is not accurate to assume that all 3- and 4-year-olds will be at one stage, 5- and 6-year-olds at another stage, and 7- and 8-year-olds at yet another stage. Because of children's varying backgrounds, coupled with varying opportunities for practice, encouragement, and instruction, a rigid, age-based approach to movement skill acquisition is not acceptable as a valid means for curricular planning. Therefore, observational assessment of the process of children's movement is essential for effective use of the developmental approach.

Observational assessment is subjective and therefore requires the teacher to have clear knowledge of what constitutes the proper mechanics of a wide variety of movement skills. The box below provides important guidelines for effective observational assessment of children's movement.

#### Guidelines for Observational Assessment of Children's Movement

When observing and assessing the process of children's movement,

- **Be unobtrusive.** This is especially important with young children, who will often alter their pattern of movement if they are aware that their efforts are being recorded.
- **Stress maximum effort.** Encourage children to throw as far, run as fast, or jump as high as they can, but keep the tone and atmosphere of the activity playful and fun. This will encourage their best performance.
- **Stand where you can clearly view performance.** Stand far enough away that you can observe the entire task.
- **Observe segmentally.** Look at one part of the movement at a time. For example, first focus on the leg action, followed by the trunk action, then the arm action.
- **Compare.** Occasionally ask another trained individual to observe and assess several children. Compare ratings for objectivity.
- **Be consistent.** Strive for consistency in your observations to maximize the reliability of your process assessments.

A segmental observational assessment instrument and a simplified version suitable for use with groups of children at the fundamental movement phase of development are displayed in Figures 7 and 8. These forms are helpful for charting entry and exit levels of ability throughout the year. An individual assessment form (Figure 9) may be filled out from the group form and sent home periodically to inform parents of their child's progress in the developmental physical education program.

*Figure 7.* FUNDAMENTAL MOVEMENT SKILLS—BODY SEGMENT/SAMPLE CLASS OBSERVATION CHART

**Fundamental Movement Skills—**
**Body Segment/Class Observation Chart**

Class _____ Observer _____

Mark the proper stage (I, E, M, S) for each body segment. Then give an overall rating in the space provided.

I = initial stage
E = elementary stage
M = mature stage
S = specialized skill stage

| Name | Running | | | | Jumping | | | | Throwing | | | | Catching | | | | Kicking | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Leg action | Trunk action | Arm action | Overall rating | Leg action | Trunk action | Arm action | Overall rating | Leg action | Trunk action | Arm action | Overall rating | Leg action | Trunk action | Arm action | Overall rating | Leg action | Trunk action | Arm action | Overall rating |
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*Figure 8.* FUNDAMENTAL MOVEMENT SKILLS—TOTAL BODY/SAMPLE CLASS OBSERVATION CHART

**Fundamental Movement Skills—**
**Total Body/Class Observation Chart**

Class _____ Observer _____

| Mark the proper stage (I, E, M, S) for each skill in the space provided.<br>I = initial stage<br>E = elementary stage<br>M = mature stage<br>S = specialized skill stage<br><br>**Name** | Stability skills | | | | | | | | | Locomotor skills | | | | | | | | | | Manipulative skills | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Static balance | Dynamic balance | Body rolling | Dodging | Springing/landing | Axial movements | Inverted supports | Transitional supports | | Running | Jumping for distance | Jumping for height | Jumping from height | Hopping | Skipping | Sliding | Galloping | Leaping | Climbing | Throwing | Catching | Kicking | Trapping | Dribbling | Volleying | Striking | Ball rolling |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |

*Figure 9.* FUNDAMENTAL MOVEMENT SKILLS/INDIVIDUAL MOTOR ASSESSMENT PROGRESS REPORT

**Fundamental Movement Skills—**
**Individual Motor Assessment Progress Report**

Child's name _____ Grade _____ Class _____

| Dear Parent: The skills checked have been assessed for this 9-week period. More than one check in a row indicates progress from one stage to another. | 1st 9 weeks | | | | 2nd 9 weeks | | | | 3rd 9 weeks | | | | 4th 9 weeks | | | | Stage of development |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Initial stage | Elementary stage | Mature stage | Specialized skill stage | Initial stage | Elementary stage | Mature stage | Specialized skill stage | Initial stage | Elementary stage | Mature stage | Specialized skill stage | Initial stage | Elementary stage | Mature stage | Specialized skill stage | Initial (beginning)<br>Elementary (primary)<br>Mature (intermediate)<br>Specialized skill (advanced) |
| Stability skills: Maintaining balance in static and dynamic situations | | | | | | | | | | | | | | | | | Comments |
| One-foot balancing | | | | | | | | | | | | | | | | | |
| Beam walking | | | | | | | | | | | | | | | | | |
| Body rolling | | | | | | | | | | | | | | | | | |
| Dodging | | | | | | | | | | | | | | | | | |
| Landing | | | | | | | | | | | | | | | | | |
| Locomotor skills: Giving force to the body through space | | | | | | | | | | | | | | | | | Comments |
| Running | | | | | | | | | | | | | | | | | |
| Jumping | | | | | | | | | | | | | | | | | |
| Hopping | | | | | | | | | | | | | | | | | |
| Skipping | | | | | | | | | | | | | | | | | |
| Leaping | | | | | | | | | | | | | | | | | |
| Manipulative skills: Giving force and receiving force from objects | | | | | | | | | | | | | | | | | Comments |
| Throwing | | | | | | | | | | | | | | | | | |
| Catching | | | | | | | | | | | | | | | | | |
| Kicking | | | | | | | | | | | | | | | | | |
| Dribbling | | | | | | | | | | | | | | | | | |
| Striking | | | | | | | | | | | | | | | | | |

_____ _____ Parent comments _____

Parent signature Date

_____ _____

Parent signature Date

_____ _____

Parent signature Date

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Parent signature Date

*Product assessment,* or *performance assessment,* is concerned with the how far, how fast, how high, or how many of movement—the end product of one's movement, as measured by elapsed time, as in the 20- or 50-yard dash; the distance covered, as in a javelin throw; or the number of repetitions, as with situps or pushups. Performance assessment is an effective, objective technique to use in skill assessment after the mechanics (process) of a task have been mastered. After children have advanced to the mature stage of a skill, they are ready to begin applying the skill to sport-related activities. For example, the mature throwing pattern can now be further developed and applied to throwing a football or pitching a baseball. A specialized sport skill, in terms of mechanics, is little different from the fundamental movement skill. The goal is different, in terms of the speed, accuracy, or distance required for success in the sport activity, but the basic mechanics are essentially the same, adapted only to the specific demands of the task.

The key to successful evaluation is to keep it simple. Elaborate diagnostic procedures are not needed. As long as teachers are familiar with the developmental characteristics of fundamental skills, observational assessment (process assessment) will generally suffice. Based on their informal evaluation of children's progress or lack of progress, teachers need to modify learning experiences. Regular monitoring of children's progress provides the information necessary for planning effective, challenging, and developmentally appropriate curriculum.

## Conclusion

The knowledge that movement skill development is heavily influenced by factors such as ample opportunities for practice, positive encouragement, and quality instruction in an environmentally sound environment has important implications for the motor development and movement education of young children. For young children, developmentally appropriate teaching is essential. This teaching must be coupled with sufficient time for practice in skill learning and the use of positive teaching strategies. Teaching, however, does not explain learning; development does. Only through the process of learning more about children's motor development are teachers able to use appropriate teaching strategies.

Motor development is a process that is age related, but it is not age dependent. The process of learning a new movement skill is age independent. Motor development and movement skill learning are highly individualized because of the unique hereditary and experiential background of each child. Therefore, it is inappropriate to classify movement activities by age or by grade level. Such a procedure violates the principle of individual appropriateness. Teachers must take care to select movement experiences based on children's developmental needs, as well as their typical age-related interests. Knowledgeable teachers of young children recognize that the developmentally appropriate movement experiences contained within the physical education program have great potential to make real contributions to children's movement literacy, fitness literacy, cognitive literacy, and affective literacy.

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# 11

# Transforming Curriculum in Language and Literacy

*Kathryn F. Whitmore and Yetta M. Goodman*

***Editors' note:*** *We gratefully acknowledge Kathy Whitmore and Yetta Goodman, who originally titled this chapter "Reaching Potentials: Personal and Social Language and Literacy Histories of Young Children." Their approach provided the conceptual organizer for this two-volume book,* Reaching Potentials. *In this chapter, Whitmore and Goodman describe the continuum of language and literacy development and how teachers adapt curriculum based on children's individual and cultural experiences—their personal and social histories.*

*The International Reading Association (IRA) and the National Council of Teachers of English (NCTE) have been working for more than three years on national language arts standards. Developing standards for language arts and reading—the tools that support learning in all other content areas—is a highly complex task. IRA and NCTE project that* Standards for English Language Arts *will be published in 1996.*

It is Kaeli's first birthday party. She is dressed in a fancy new romper and new birthday shoes. A party blower protrudes from her mouth as she toddles around between the legs of the invited guests. One of the gifts is a set of board books, *My First Words: In My Room,* by Margaret Miller (1989). These books are new titles, but books are familiar objects to Kaeli, and she immediately plops down on the patio floor and begins to "read." She holds one book, upside down, in her chubby hands. She turns the pages awkwardly but with a purpose. "Da," she reads. "Da," she continues. "He'y'a," Kaeli sings to her mom as she hands the precious gift over and waits to be picked up to experience the book from her mother's lap.

Kaeli already understands an enormous amount about her world and about how oral and written language operate in it. She loves her new books and knows what oral language to use as she transacts with them. She uses different forms of oral language to read to herself and to communicate with her mother. What Kaeli does and says reflect the sociocultural transactions that are becoming her *personal* literacy history. Kaeli is moving toward the language goals that NAEYC and NAECS/SDE suggest for all children:

> Children use language to communicate effectively, and to facilitate thinking and learning. Children become literate individuals who gain satisfaction as well as information from reading and writing. (1992, 18)

By Kaeli's third birthday she is a complete participant in her language community. Her oral language develops explosively and is comprehensible to any

listener (Glazer 1988). She continues to listen to and understand oral languages, including the English her mother speaks, the Spanish her father speaks, and various dialects of those languages present in her community. Kaeli continues to read, as well, and grows in her sophistication about print in her world. Well before her third birthday, Kaeli begins to write. As a toddler, she already holds pencils and crayons, makes marks on paper, and carefully watches others use writing materials.

As she enters kindergarten, Kaeli's knowledge will expand to include new functions of language, those having to do with instruction and school. The manner in which that instruction occurs may support, extend, and enrich what Kaeli already knows. The possibility also exists, however, that Kaeli's abilities and understanding will be altered or even destroyed if she finds herself in a classroom that does not value her construction of meaning, holds inappropriate expectations for her development, or strips her of the power she already possesses over language (Taylor 1991, 1993; Bredekamp & Rosegrant 1992).

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The purpose of this chapter is to provide current knowledge about how young children construct meaning in language and literacy and to provide a foundation for implementing transformational curriculum (see Chapter 3, p. 18) and appropriate assessment. With such knowledge teachers can make decisions that support, extend, and enrich a developmental process that occurs naturally for children actively participating in a literate world. Teachers need to understand the developmental continuum of individual children to organize curriculum meaningfully and assess children's abilities appropriately. Specifically, this chapter

- describes how children develop language and learning by presenting a theoretical framework that explains children's construction of meaning;
- describes how the sociocultural context, especially multicultural issues, affect our understanding of how literacy functions in society;
- presents examples of the developmental continuum of learning oral and written language for children from birth through age 8; and
- describes developmentally appropriate curriculum that supports children's language development in school settings and an assessment process designed to support the learning process.

## How children develop language and literacy: A theoretical framework

The oral language Kaeli displayed at her birthday party demonstrates a tension that exists between personal invention and social convention. As she reads, Kaeli invents "da," an expression of language, and "he'y'a," representing the conventional phrase "Here you are." These are examples of how Kaeli's invented language is being influenced through transactions with her social community. By her first birthday, Kaeli's language inventions are already being transformed so that they are conventional enough to be understood by others. Human language is both a *personal invention,* something each individual creates from within, and a *social convention,* something that is shared by members of a community. To be effective, language must meet both the *expressive needs* of the speaker and the *comprehension needs* of

***THE CORE OF YOUNG CHILDREN'S LITERACY DEVELOPMENT IS THEIR STRIVING TO CONVEY MEANING THROUGH WRITING OR INTERPRET MEANING THROUGH READING.***

the listener. Language "is invented by each individual and in the context of its social use, [language] is adapted to the social conventions" (Goodman & Goodman 1990, 232).

### *Personal invention*

Many researchers emphasize the individual's ability to construct his or her own meaning in language (Piaget 1967; Ferreiro & Teberosky 1982; Y. Goodman 1990; Elkind 1991). Ferreiro and Teberosky (1982) emphasize a view of the learner as a producer of knowledge rather than as a recipient of knowledge. Accepting children's active role in language learning places the child at the center of the learning process. For instance, children's universal overgeneralizations in oral language, such as "I goed" or "You drinked," are the natural result of children's construction of language rules. Such overgeneralizations must be recognized as evidence of growth because they show how children

> attempt to understand the nature of the language spoken around them, and, in trying to understand it, formulate hypotheses, search for regularities, and test their predictions. Consequently they form their own grammar, which is not simply a deformed copy of the adult model but an *original creation.* Instead of receiving bit by bit a language entirely fabricated by others, children reconstruct language for themselves, *selectively* using information provided by the environment. (Ferreiro & Teberosky 1982, 8, emphasis added)

### *Social convention*

Other researchers (Moll 1990; Dyson 1993) place more value on the social component of language development. Vygotsky states,

> Language arises initially as a means of communication between the child and the people in his environment. Only subsequently, upon conversion to internal speech, does it come to organize the child's thought, that is, become an internal mental function. (1978, 89)

Vygotsky's value of speech as a tool for thinking becomes evident when children solve problems with other children and adults. "Children solve practical tasks with the help of their speech, as well as their eyes and hands," states Vygotsky (1978, 26). Speech is a tool that children should have access to whenever solving problems at school.

### *The tension between invention and convention: Transaction*

Recently some language theorists have proposed more of a tension between the forces of personal invention and social convention that shape language development. This tension is evident in the learning cycle presented by Bredekamp and Rosegrant in Volume 1 of this work (1992, 32–33). Language invention is constantly present as individuals strive to express themselves and make meaning. Meanwhile, "the community pushes (children's) language back toward the center of *shared* language and *shared* meaning" (K. Goodman 1986, 22, emphasis in original). Expression and understanding both occur through this *transactive* process.

Halliday (1975) equates language development with "learning how to mean." His work helps us recognize the functional purpose of early infant language. In Halliday's terms, Kaeli's language represents her "meaning potential." The meaning potential is obvious in her language when "da" means "reading talk" and "he'y'a" means "Take this book and pick me up so we can read together." Kaeli also sounds very different when she calls for help, plays with language, or tells her family that she is ready for a nap. These differentiations are easily distinguishable by her caregivers.

By understanding the meaning potential of young language users, teachers and caregivers recognize that as soon as there are meaningful expressions, there is invented language, even before children speak with conventional words or structures. Halliday's theory shows us that *function* (the reasons Kaeli uses language) precedes *form* (the appropriate sounds and order of her words). Form develops from the functional needs of language in everyday use.

The core of young children's literacy development is their striving to convey meaning through writing or interpret meaning through reading. The tension between invention and convention, or function and form, continues to be evident as children develop literacy. When children's attempts at making meaning are ignored or misunderstood, they are sacrificed for a well-intentioned adult's emphasis on conventions and standardization (Taylor 1991; NAEYC & NAECS/SDE 1992). Teachers can take full advantage of the potential of meaning in language by helping children capitalize on their knowledge and by respecting the language uses and forms that children bring to school. With information on how children invent

their own language and literacy, early childhood teachers support children's natural language development and ensure that children experience success with the various functions of oral and written language.

### *Multicultural views about literacy*

"Do you expect your child to learn how to talk?" Brian Cambourne, an Australian researcher, asks the parents of infants during trips to the supermarket (Cambourne & Turbill 1987). As he wanders through the aisles, he enjoys informally observing young children in the store with their parents and the interactions that they share. The parents are extremely surprised by the question, and all of them respond yes, once they regain their composure. We all expect that our babies will learn to talk, and, given normal development and healthy physical growth, babies *do* learn to talk.

Do we expect young children to become readers and writers with the same exuberance? Evidence from studies of one slice of U.S. society indicates that some families do expect literacy abilities to develop right along with oral language (Taylor 1983). In families such as Kaeli's, where books, reading, and writing are a way of life, "it is assumed that children will become literate, and so literacy activities often are taken for granted or are backgrounded in relation to the social functions and interaction in which they occur" (Schieffelin & Cochran-Smith 1984, 10).

Educators must be informed about "the similarities and differences in the meanings, functions, roles, and contexts of literacy in given social groups" (Schieffelin & Cochran-Smith 1984, 11). Literacy may be used for an unlimited number of reasons to meet an unlimited number of functions through unlimited types of forms. Many studies document how literacy functions for families that live in inner-city (Taylor & Dorsey-Gaines 1988; Gonzales et al. 1993) or rural areas (Philips 1975; Heath 1983; Fishman 1988), where they are impoverished and oppressed by dominant views and definitions of who they are. The similarity of such findings becomes clear in conclusions eloquently stated by Taylor and Dorsey-Gaines:

> It is evident that the families with whom we were working are more than fillers in of forms—*they are active members in a print community in which literacy is used for a wide variety of social, technical, and aesthetic purposes, for a wide variety of audiences, and in a wide variety of situations* . . . . Thus, in focusing upon the children, we cannot emphasize enough that *they are active participants and interpreters in a social world in which texts are written and read.* (1988, 200, emphasis in original)

Their findings demonstrate the need to gain the insider's perspective into what roles and functions language and literacy serve in difficult, real, and personal lives.

Philips (1983) observes that the children of the Warm Springs Indian Reservation communicate in ways that are viewed as inappropriate by their Anglo teachers, causing "mutual noncomprehension between student and teacher" (p. 106). The typical classroom event of "show and tell" clearly demonstrates the gap between what young Indian children learn at home and what they are expected to do at school. Whereas children at home are socialized to not call attention to themselves, at school it is specifically that behavior that is expected and rewarded by teachers. As Philips demonstrates, "The Indian children . . . experience conflict between their community socializing experiences and classroom socialization—a conflict that continues into adult life" (1983, 125).

More than 20 years ago, Goodman (1971) challenged the stereotypical deficit notion that children in U.S. inner-city schools lack culture. In Detroit, she collected rich songs, rhythms, and oral traditions from African American children. "When one approaches a group of children without preconceived notions, it is possible to discover strengths as well as weaknesses, a different cultural pattern rather than a deprived one, different language patterns rather than no language" (1971, 378).

A bulletin board in one working-class home uses print to organize the life of the family (Leichter 1984). Here, literacy is used to symbolize ethnicity, reflect ideology, recognize ceremonial events, organize memory, reinforce relationships between family members, commemorate special events, record community happenings, and negotiate economic issues.

Heath's work (1983) documents how functions of literacy differ in working-class communities that vary racially and historically. Heath describes Lillie Mae, as she reads a letter aloud to her neighbors on her front porch in the Black community of Trackton; she and her neighbors bring their collective experiences to interpret the text beyond mere decoding. In Roadville, a White community, the frequent use of letters and notes is an example of how writing is more of an individual activity, privately carried out. Regardless of how each community varies in its sources of literacy materials, its manner of relating to print and its values about why literacy is important, especially for growing children, Heath concludes, "Neither community's ways with the written word prepare it for the school's ways" (1983, 235).

Taylor and Dorsey-Gaines' (1988) descriptions of literacy development in the culture of inner-city chil-

dren raise questions about schools' stereotypical expectations. Jerry's lengthy lists of "literature read and owned" (p. 141) and "books to buy" (p. 144) challenge a traditional belief that poverty-stricken families do not participate in recreational reading. Iesha's detailed letters to Teko's teacher and the school nurse represent the interpersonal function of communicating important messages through writing. The poignant autobiography by Tanya's mother not only conveys the deep love of a mother for her children within the struggle of inner-city life but also accentuates the sociocultural history of a 38-year-old woman and how she shares her culture and history with her family, preserving it through written language.

With such a rich storehouse of documented cross-cultural uses of language and literacy, we can now eliminate stereotypes about groups of people, value children from all families by rejecting labels such as "at risk," and challenge myths and school practices that bind children through reduced expectations. Flores, Tefft-Cousins, and Diaz (1991) state, "The myths about children of color, children from low socioeconomic backgrounds and children identified as learning disabled need to be boldly exposed and discarded from our beliefs, our expectations, and from our everyday practices" (p. 377). Similarly, with concern for family literacy, Auerbach (1989) calls for a rejection of the school transmission practices model, wherein the school's definition of learning and knowledge is privileged and is transmitted to families and communities. Rather, we should move toward a social-contextual approach that seeks to understand, validate, and actively make use of families' and communities' ways of knowing in classroom settings.

## The developmental continuum of language and literacy learning

Young children from varied cultures and backgrounds know a great deal about language before they come to school (Clay 1975; Ferreiro & Teberosky 1982; Heath 1983; Harste, Woodward & Burke 1984; Goodman, Altwerger, & Marek 1989). In this section we present some developmental moments (in bold italics throughout) that demonstrate the complex continuum of language and literacy development. Developmental moments are like still-frame photographs of movement and change. They capture learning in a preservable anecdote, transcript, or reading or writing sample. Reading, writing, and oral language are difficult, if not impossible, to isolate from one another in early development. Teachers may use these continuum examples as a guideline and add their own examples to represent the oral and written language development of the children they teach.

In responding to the continuum, teachers and caregivers must consider that "how one learns written language is not different from how one learns oral language" (Harste, Woodward, & Burke 1984, 193) and also that all children develop at their own rates and in their own directions in their sociocultural environments. Maturation and environmental experiences vary from child to child. *It is therefore virtually impossible, nor is it desirable, to provide a definitive sequence or an age-regulated timeline for language and literacy development.* "Children acquire a common fund of concepts but the point of entry and the path of progress may be different for any two children" (Clay 1975, 7).

***Children distinguish between drawing and writing; they differentiate the organization of each and represent appropriate writing systems through their early writing marks.***

In Figure 1, 3-year-old Monica draws a picture of her horse and writes both her name and her horse's name on the same page. Although Monica's writing marks are not conventional enough to be read by others, her drawing is clearly distinguishable from her writing, according to conventional standards, and the marks that represent name writing are approximate to the cursive writing she frequently watches being used around her (Lieberman 1985).

***Figure 1.*** MONICA'S PICTURE OF HER HORSE AND THE WORDS *MISS MUFFETT* AND *MONICA*

In addition to differentiating between drawing and writing (Ferreiro & Teberosky 1982), children's early invented marks on paper approximate the writing system that they experience (Harste, Woodward, & Burke 1984; Y. Goodman 1986). Marie's early writing, at age 3 years 6 months (see Figures 2 and 3), illustrates her awareness of the English and French languages written in the sociolinguistic context in Montreal (Maguire 1989, 20).

*Figure 2.* MARIE'S EARLY WRITING IN ENGLISH

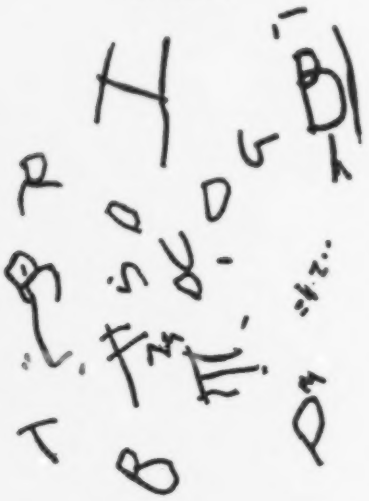
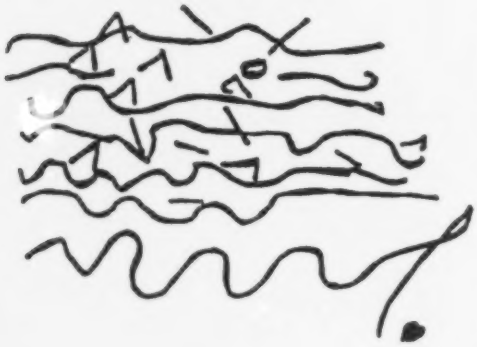


*Figure 3.* MARIE'S EARLY WRITING IN FRENCH



Marie shows that "children who grow up with other forms of writing systems scribble differently, produce characters or letter forms which resemble the orthographic system in their culture" (Y. Goodman 1986, 10). Monica and Marie each reflect the sociocultural experiences that influenced their personal literacy concepts by 3 years of age.

***Children represent themselves with a written symbol, usually the first letter of their first name, and then use name letters as resources to read and write.***

Monica, age 3½, has recently begun to read *M* as representative of herself. Standing by the car door one day, Monica notices an *M* embedded in the words "METRIC RADIAL" on the tire. "Look, Mommy, I'm on the tire!" exclaims Monica in amazement as she lightly touches the *M* with her finger.

As with most children, Monica's name reading and writing reflect her developing understanding of written language without direct instruction (Hildreth 1936; Ferreiro & Teberosky 1982; Harste, Woodward, & Burke 1984; Vellender 1989). In describing the name writing of 3- to 5-year-olds, Lieberman (1985) provides evidence of name writing as a constructive but predictable and describable process. We believe that this movement from invention to convention in name reading and writing parallels all of reading and writing development.

For example, about three months transpire between the time that Monica reads *M* as representative of her, alone, and the time that she accepts *M* as equally representative of her older brother Martin. A month or so later, Monica reads a paper bag from McDonald's as "McDonald's," saying, "No, it's not Burger King. It's McDonald's because it has an *M*, just like Monica and Martin and Mommy!" Already Monica is moving from her personal use of written language to a more shared, or social, use, thereby expanding the pool of knowledge she has about print and simultaneously internalizing the basic notions of conventional usage.

Children also use the first letters in the names of others to help them sort out the system of written language (Lieberman 1985). Joshua, 5 years 2 months, is at his grandmother's house. Grandma is working at an unfamiliar computer keyboard and has trouble finding the key that tells the computer to print her document. "Where's 'print'? Where's 'print'?" she says to herself. Then she turns to Joshua, who is hovering by her left elbow. "Joshua, where's 'print'?" she says.

"Here it is," he says, pointing to a switch labeled "PRINTER."

Amazed, his grandmother inquires, "How did you know that?"

Matter-of-factly, Joshua points to the *P* with his finger, "Because it has that letter."

"What letter is that?" asks Grandpa, entering the conversation.

Joshua takes his index finger and draws a *P* in the air.

"*Whose* letter is that?" his mother inquires.

"Pedro's," Joshua answers.

Joshua is not yet able to use the letter name *P*, but he makes connections to the print world with his own life experience. He uses the resources he has discovered in preschool (that is, the names of his preschool friends), as well as the resources he knows from home, to read print in another setting. At 5, Joshua has more information upon which to draw his conclusions and make predictions about reading and writing than does 3-year-old Monica.

***Children use random letters or the letters from a familiar name—without a relationship to the sound system of the language—to hold places for meaning in written language.***

Yvette, who began kindergarten as a monolingual Spanish speaker, is writing as her teacher, Kathy Whitmore, observes. She doesn't hesitate as she writes, and she gives the impression that she is working hard. Yvette's product looks like this:

***Figure 4.*** **YVETTE'S LIST OF WORDS**

Yvette knows that letters make words and that words need many letters in various order to represent different meanings (Ferreiro & Teberosky 1982: Ferreiro 1990). Yvette uses the letters that she knows from her experiences (primarily from her name and the conventional phrase, "I love you") to "mean" the words she writes. She uses different combinations of the limited resources at her disposal for each and every word.

Although there is not yet a relationship between the sound patterns and the letter patterns that Yvette selects, her past experiences provide her with opportunities to learn about print and to demonstrate her unique level of knowledge (Y. Goodman 1986). She has more information about written language than either Monica or Joshua, and she uses that information to invent written language that is becoming more conventional.

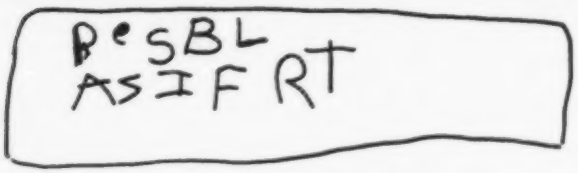
***Children are able to communicate through written language by controlling the ways the orthographic system (the print) specifically relates to the phonological system (the sounds).***

Children must come to understand the complexity of the written language system, not only how sounds relate to the graphic information (phonics) but how they both relate to meaning (K. Goodman 1994). Brenda, age 5, writes a goodbye message to be included in a classroom book. She writes, "Barb I hope you like school."

***Figure 5.*** **BRENDA'S ALPHABETIC SYLLABICATION WRITING**

Brenda uses a resource to spell her student teacher's name conventionally, then exhibits a phenomenon called syllabication (Ferreiro & Teberosky 1982) as she writes the rest of her message. Brenda represents each syllable of her message with one symbol, in this case, a letter that corresponds to the dominant sound of the syllable. She represents "I" with *I*, "ho" with *O*, "pe" with *P*, "you" with *U*, "like" with *L*, and "schooi" with *S*. Most enlightening in this example is Brenda's use of *OP* for "hope." Her choice may be explained two ways. First, Brenda may be in a period of transition, in which a one-to-one correspondence between syllables and letters is augmented by more than one letter when she hears two prominent sounds. Another explanation, however, is that Brenda may actually hear (and/or say) two syllables in the word *hope* by elongating the vowel *o*. Therefore, she represents each of these phonetic segments with a separate letter in print.

*Figure 6.* MARTIN'S ALPHABETIC WRITING




*"Baseball is my favorite"*

Martin, also age 5, has taken a dramatic step in his literacy development. He has had a sufficient amount of time and range of experiences with written language to bring together the reasons for writing, the forms for writing, and the choice of appropriate symbols for the concepts he wants to represent in writing. The choices he makes are semantically (the meaning system), syntactically (how the language segments relate to each other), and graphophonemically (the relationship between letters and sounds) appropriate for his purposes. His writing is now consistently alphabetic (Ferreiro & Teberosky 1982). Because Martin represents many of the sounds of words with appropriate letters, his writing may be read easily by readers who know Martin well and understand the developmental process of invented spelling (similar to the manner in which Kaeli's parents are able to understand her early speech).

***Children are able to comprehend written language as representing consistent meaning in reading their world.***

Monica, age 3 years 10 months, plays at a toy kitchen. She reaches for a small toy can of vegetable juice on the shelf above the stove. As she pulls down the can, she hits herself on the side of her head and cries, "Oh! I should have had a V-8!" Later in the day, when she passes the Firestone building, Monica says, "Look, Mom, that says 'truck fixing place.'" Later that evening Monica asks her mom to "Sing me this book," as she hands her a book adapted from a children's song. Monica knows which pages are for reading and which pages are for singing (those that include musical notation).

Monica demonstrates the ability to read her world (Allen 1976; Harste, Woodward, & Burke 1984; Freire & Macedo 1987). She shows what knowledge she has internalized from her social world by using information from interactions with symbolic information (from television, preschool, church, and previous family interactions) in *her* world to read and develop an association between symbols and their meanings. Other children, with different experiences and sociocultural backgrounds, read their world in different, but also culturally relevant, ways.

***Children are able to comprehend written language as representing consistent meaning in reading the world of books.***

Preschoolers demonstrate their reading knowledge as they first point to the illustrations and later point to the print for "where to read"; identify parts of books, such as the covers; know in which direction pages and books must be read; and tell elaborate stories that reflect the characters and plots in the illustrations (Goodman, Altwerger, & Marek 1989). When adults read with children, their interactions help children construct meaning about the text. Children are helped to make personal connections to reading materials by relating them to their own experiences, beliefs, and practices (Altwerger, Diehl-Faxon, & Dockstader-Anderson 1985; Sulzby & Teale 1991).

As children repeatedly experience books and other materials, both at home and in early childhood classrooms, they further define their ideas of how to read print. The stories they create become more coherent and story-like, their characters become more complex, dialogue often enters their reading, and so on. Their oral language becomes more closely associated with the actual content of the materials.

Matlin Haussler (1982) examines the process of early reading development in kindergarten and first grade and describes some examples of the developmental continuum for 5- and 6-year-olds reading at school. Children first make use of pictures to tell narratives. A growing sense of story (Applebee 1978) enables children to elaborate upon the stories they tell. Many children who are read to frequently demonstrate an ability called holistic remembering. They appear to have memorized the story during repeated readings and can relate it virtually word for word without adult assistance. This is not a simple memorization task; it is an important aspect of reading development for many children. At this point in development, reading is a very global process, and children rely mostly on the meaning to read (Holdaway 1979; Goodman, Altwerger, & Marek 1989).

As children come to understand that print conveys the meaning of language in books, they demonstrate their knowledge that print is read from left to right. They predict and self-correct based on their growing knowledge of the language cuing systems and over time begin to learn the complex relationships between the sound system and the graphic system (Matlin Haussler 1982). As children repeatedly experience the alphabetic system by reading the world, by reading the

world of books, and by writing, they develop strategies for using all three kinds of information (graphophonic, syntactic, and semantic) in an integrated and simultaneous way. Eventually, in this gradual process of becoming readers, children are capable of reading connected discourse.

Second-grade Nick is reading a story to his teacher, Wendy Hood (personal communication, 10/16/91), about how ducks stay dry in water. One line of written text says, "She rubs her bill in the oil and spreads it over her feathers." As he reads, Nick substitutes the word *burrow* for *bill,* but when he gets to *oil,* he goes back and reads, "She rubs her beak." Nick pauses, looks at the word closely, says, "Oh, *bill,*" and then proceeds with the rest of the story. Afterward he and his teacher discuss the story. Nick says, "At first I had trouble with the word, *bill. Burrow* didn't make sense. Then I thought it was *beak*, but *beak* wouldn't have *L's*, so I tried *bill*, and I remembered knowing duck beaks are called bills."

This example occurred during a procedure called miscue analysis, in which the teacher listens to a child read orally without providing any assistance (Goodman, Watson, & Burke 1987). In this way, children read as they do when they are on their own. Nick's unexpected responses, or miscues, show his focus on making sense of the text. He changes *burrow* to *beak* when he realizes that *burrow* doesn't make sense. He also pays attention to the syntax and the graphophonic systems, however, as he appropriately substitutes nouns for nouns and as he realizes that *beak* doesn't contain the letters of the word he is reading. Finally, he uses his prior knowledge about ducks to confirm the semantic relationships between *beak, bill,* and *duck.* Children's miscues demonstrate their strength as readers.

A group of eight third-graders gather around the tape recorder on the floor of their classroom. They have been meeting together as a literature study group for a number of weeks to discuss a set of books about war and peace issues (Whitmore & Crowell 1994). Among the books they have read are *Rose Blanche,* by Roberto Innocenti and Christopher Gallaz (1985); *The Wall,* by Eve Bunting (1990); *My Hiroshima,* by Junko Morimoto (1987); and *Faithful Elephants,* by Yukio Tsuchiya (1988). Today's topic is Dr. Seuss's *The Butter Battle Book* (1984), and the children are comparing it to the other books in the set. The group consensus quickly becomes apparent. They think that *The Butter Battle Book* is lacking in comparison to the others. The comments include, "It's a little kids' book," "The illustrations are too simple," "It isn't real," and "It doesn't make you ask hard questions." These factors define "good literature" for this group of readers.

These children demonstrate the ability to be critical readers (Sloan 1984). They are asking thought-provoking questions, comparing and contrasting, critiquing written and illustrated texts, evaluating depth and seriousness of plot and character development, and, most importantly, connecting personally to the books they are reading. Their abilities, sophisticated as they are, are not unreasonable goals for early childhood teachers who understand how "reading the world of books" develops and who organize classrooms rich in literature, reading, and serious discussions.

***Children demonstrate knowledge about the various genres of written language through a variety of reading and writing forms.***

Children begin to demonstrate their knowledge of genre (or different language forms) at a young age (McNamee 1990). Applebee, in an in-depth study of young children's growing sense of story, finds that

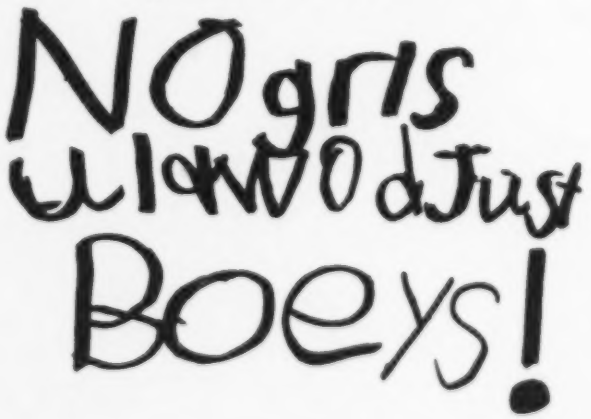
> Even the two-year-olds studied used at least some of the conventions studied in 70 percent of their stories. By five, they had begun to absorb common story characters into the stories they told, and by six, to explain their expectations about witches and fairies, lions and wolves. (1978, 52)

Children's ability to follow conventional "storyness" at such an early age is a reflection of their wealth of experiences with the genre in both oral and written traditions.

Martin, now 7, reviews what he wrote during his first-grade year (Whitmore & Nieves 1991). His writing is accentuated with examples such as the following. (Conventional spelling is provided in the captions.)

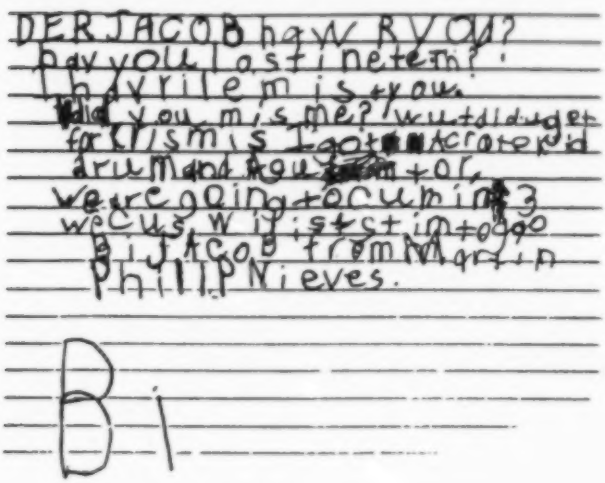
Martin's examples show how genre is invented by language users as they create forms to meet their func-

*Figure 7.* MARTIN'S SIGN



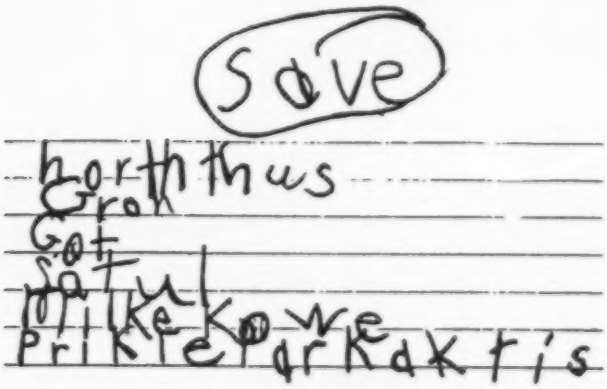

*"No girls allowed. Just boys!"*

*Figure 8.* MARTIN'S LETTER TO JACOB



*"Dear Jacob, How are you? Have you lost any teeth? I have really missed you. Did you miss me? What did you get for Christmas? I got a Karate Kid drum and a guitar. We are going to come in three weeks. Well, it's time to go. Bye, Jacob. From, Martin Philip Nieves. Bye."*

*Figure 9.* MARTIN'S LIST OF ITEMS FOR A SCAVENGER HUNT



*"horseshoes, grain, goat, saddle, milk cow, prickly pear cactus"*

tional needs for authentic communication. For each of the functions met through written language, a new form is created that best accommodates the purpose, limits, and intentions in a meaningful and efficient manner. Thus, the syntax used, the vocabulary and punctuation chosen, the writing materials selected, and the style of writing displayed vary according to the needs of the author and the audience. Martin's sign, for example is written in bold letters with a thick, bright green marker. His emotions are emphasized with an exclamation mark. His scavenger hunt list is concise and is written in a vertical form. It is marked with a circled "save," labeling it as a memory device. In further contrast, the letter written by Martin, on stationery, shows his knowledge of letter language, appropriately selected for correspondence purposes. When Martin writes stories, they are marked by the literary language found in books, particularly fairy tales ("Once upon a time . . ."), one of his favorite genres. The print in each of these examples is organized differentially depending on the genre it represents. Those who know Martin observe that none of his writing uses the language of his conversation. Rather, it illustrates the language he has experienced repeatedly while reading.

It is the *variation of experiences* that makes for a variety of functions for young children's written language products. The forms, therefore, vary accordingly. Children who experience a range of reading and writing in their homes, classrooms, and communities will create examples of them in their own writing (Harste, Woodward, & Burke 1984; Wortman 1991). Children of sports-minded parents or older siblings may keep scorecards, for example. Mathematically or musically oriented families may find representations that reflect those types of symbol systems. Families who clip coupons from newspapers and magazines with their children discover how knowledgeable these children are about reading and writing coupons. Given authentic audiences and purposes, as well as appropriate materials, children read, write, talk about, and enjoy a wide variety of genres in early childhood classrooms.

***Written language production becomes increasingly conventional in terms of the orthographic system of the language used.***

Children come to realize that letters provide cues for reading and that sound patterns in oral language are related to letter patterns in written language. Following this discovery, each child's inventions eventually need to become conventionalized for general communication. Spelling and punctuation are two good examples of how the English language system is invented by each child and becomes more and more conventional with authentic experiences.

Joshua, age 5 years 7 months, writes a birthday card to his little sister, Rachel (see Figure 10). Joshua's mom provides him with the conventional spelling for

*Figure 10.* JOSHUA'S CARD TO RACHEL

"Dear" and "Rachel" but then encourages Joshua to write on his own.

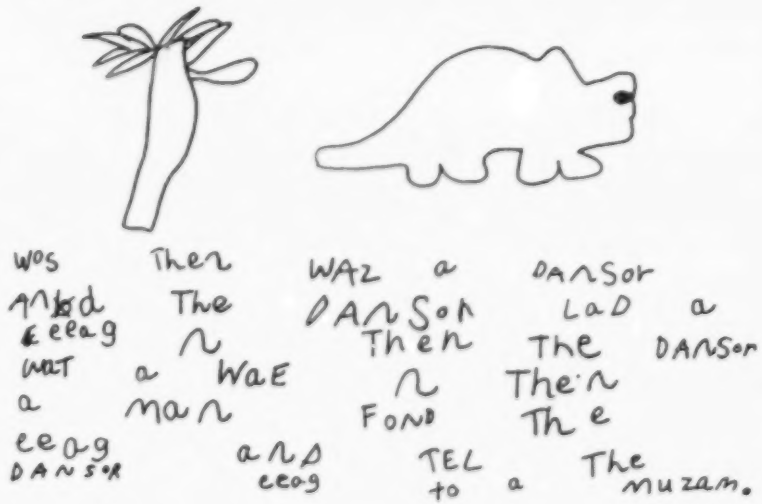
Beginning at the bottom of the card and moving up from left to right, Joshua writes, "Dear Rachel, This note is from Joshua." He invents his own spellings; he chooses *C* for *S* (letters that represent the same sound) in "this," for instance, and represents the vowel sound in both *this* and *is* with *E*. Joshua probably makes this choice because the vowel sound in *this* and *is* is closer to the way *E* is articulated in the mouth when we say the letter's name than to the *I* sound when we say that letter's name (Read 1975). He leaves off the *E* in *note* and doesn't represent the *O* in *from* with a separate letter. Most interesting, however, is the last letter in the word *from*. At first glance, it appears that Joshua has simply turned an *M* upside down in an immature effort to represent that sound. In reality, Joshua's thinking is much more complex, and it may follow this line of reasoning: Joshua's mother's name is Wendy. Joshua frequently refers to his mom as "Wendy." *W* is for *Mom* and *Wendy*, the same entity. The use of *W* to represent the *M* sound represents *his* personal language history.

Children invent punctuation for equally logical reasons, and the products of their inventions are quite enjoyable for knowing adults. The following punctuation mark was invented in a kindergarten classroom and shared by the teacher who appreciated its wisdom and insight.

Daisy, age 6, defines her punctuation mark (∿) to her teacher by explaining, "I needed to take a breath. This tells kids who read my story when to breath." (See Figure 11.) Daisy intuitively realizes the need for breaks in written discourse and marks sentence boundaries. Her invented "breathmarks" will eventually give way to the conventional forms of punctuation as she reads and writes more at school and at home.

Daisy shows control over the spelling of her high-frequency words *(a, and, the, then, man,* and *to)*. She invents spellings for the words she has written less frequently. As these words are read in a variety of contexts and written for many purposes, they will also become conventionalized. This pattern of control over the spelling of high-frequency words and inventions of low-frequency words continues throughout the primary grades (Wilde 1991). Spelling inventions provide excellent information about the knowledge children have about phonics.

*Figure 11.* DAISY'S INVENTION OF "BREATHMARKS"


WOS Ther WAZ a DAnSor
and The DAnSor LaD a
eeag ∿ Then The DAnSor
WAT a WaE ∿ The∿
a man FOND The
eeag and TEL a The muzam.
DAnSor eeag to

*"Once there was a dinosaur and the dinosaur laid a egg. Then the dinosaur went away. Then a man found the egg and took the dinosaur egg to a museum."*

Punctuation and spelling inventions suggest the notion of "constructive error" that is discussed by Ferreiro and Teberosky (1982) and supported by the curriculum guidelines of NAEYC & NAECS/SDE (1992). Research demonstrates the value of understanding that children's inventions, perceived by unknowing adults as mistakes, are examples of what children *know*, not what they don't know. Joshua demonstrates a lot of knowledge about phonics. Fourteen of the 18 letters that Joshua selected to represent his message (excluding those letters his mother provided for him) are appropriate according to conventional standards. The other four letters can be explained according to knowledgeable thinking about how a complex language system works. A qualitative look at his spelling miscues provides the adults around him with a rich body of information about what Joshua knows and about how Joshua's inventions approximate conventions.

Similarly, although the breathmarks in Daisy's example are far from conventional in terms of form, they are right on target according to function. They, along with Daisy's oral explanation, show that she understands how punctuation works. In addition, a clear period at the end of the story demonstrates that she is gaining an understanding of conventional punctuation marks, as well.

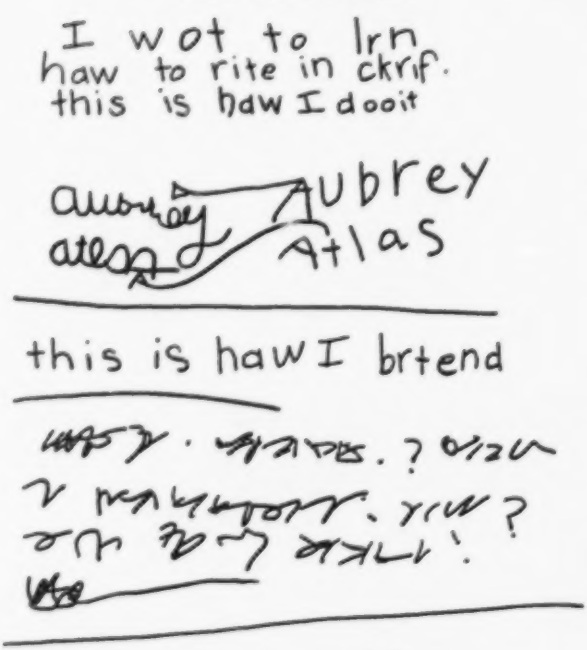
***Children invent the handwriting they use (particularly in terms of manuscript versus cursive forms) in somewhat predictable fashion.***

As children read the world, they will most likely begin to write in capital letters as reflective of the environmental print they read around them (Y. Goodman 1986). For the most part Joshua uses all capital letters in his birthday card. Similarly, children's early markings for writing, like Monica's signature and Marie's writing in French, look more like cursive than manuscript, in part because children see adults writing most frequently in cursive.

Handwriting serves one essential purpose in communication: to make written language legible for reading. There is little reason to fuss over the forms of writing a child uses as long as it is moving toward legibility. Copying, the old-fashioned method of teaching handwriting in early childhood programs, is an unnecessary—in fact, limiting—component of language arts (Ferreiro & Teberosky 1982). "Only the act of writing faces children with the challenge of representing intentions in graphics to be read" (Dyson 1985, 510).

Aubrey, age 6, provides an example of play with language as she expresses her desire to learn how to write in conventional cursive script in a journal entry. Notice the punctuation in her pretend handwriting.

***Figure 12.*** **AUBREY'S JOURNAL ENTRY OF PRETEND CURSIVE**


I wot to lrn
haw to rite in ckrif.
this is haw I dooit
Aubrey
Atlas
this is haw I brtend
You are very good at cursive! I'm not very good at it because I like to print. Here's my name in cursive:
Michele O'Brien
Michele O'Brien

*"I want to learn how to write in cursive. This is how I do it. Aubrey [in cursive] Aubrey [in manuscript]. This is how I pretend."*

Aubrey's teacher, Michele O'Brien, could now provide Aubrey with some more conventional ideas about how cursive works, particularly with her name, because it is apparent that there is an authentic purpose for Aubrey to learn more conventional styles. She could also help Aubrey find instances of conventional punctuation in what she reads, because it is clear that Aubrey's use of punctuation is more apparent in her "play" cursive than in her "real" cursive or in her writing in manuscript.

***Language becomes understood as an object of study (metalinguistic awareness).***

Seaaira, an 8-year-old third-grader, explains her interests in language and thinking.

"I'm interested in like how if other people, when they speak different languages . . . if they like think that means 'the' or if they think it in a different way.

I don't know how to explain it . . . . Like Lolita speaks Spanish, too, and like if she says 'the' if she says (it) like the other people think in English, or if they think like in a different way."

Seaaira is having a difficult time explaining her complex question about how language works. But her teacher understands what she means: Does her friend Lolita (and other bilingual speakers) think in Spanish or in English—does it mean the same in both languages? In her own words, Seaaira is asking the kinds of questions that adults ask. In adult terminology, do bilingual people think in one or two languages? If two, does the symbolic representation of the intended concept change across languages? Do people think in language at all? These are issues linguists and psychologists debate. They are precocious questions raised by a young girl who is surrounded by authentic bilingual language experiences and who verbalizes her growing questions about language in general to a receptive and understanding teacher (Whitmore & Crowell 1994).

Martin, also age 8, asks, "Mom, how do words get to be?" "Well, what exactly do you mean?" responds his mother. Martin continues, "Well, how come *dad* means "dad" and *mom* means "mom"? Why doesn't *dad* mean "mom" and *mom* mean "dad"?" Martin and his mom play with language by exchanging the two words in different sentences, such as, "Dad is the mother of the family and mom is the father!" Martin also contemplates the world of language from a metalinguistic perspective. How do words come to be? How do they come to mean what they mean? Why do they vary across languages? Why do various dialects exist?

Seaaira's and Martin's questions show how children become interested in language itself. They also demonstrate how very difficult it is to verbalize intuitions about how language works. Because they have the opportunity to interact with language in settings that foster curiosity and validate children's thinking and invention, their comments are valued as important. Through repeated authentic experiences with talking, reading, writing, and listening to stories and songs from different places in the country and the world, children have the opportunity to question and "wonder out loud" about the language(s) around them.

### *The developmental continuum in summary*

To summarize, language and literacy development occurs on a continuum of learning from birth through adulthood. The continuum moves from invention to convention (Goodman & Goodman 1990), from inexperienced to experienced (Barrs et al. 1989), from early attempts to maturity (Stewart et al. 1988), from context-dependent to more differentiated (Dyson 1985). The continuum is exemplified in each child's personal language history, which may be collected, analyzed, and enjoyed by parents and teachers alike.

Slowly, nurtured by the social experiences of the oral and written language of the home and school, the inventions of young children approximate the conventions around them. The job of early childhood educators is to continue to enrich this process, recognizing the tension between invention and convention, responding seriously to children's questions and supporting children as they strive to reach their developmental potentials in language and literacy.

## Language and literacy at school: Whole language curriculum and appropriate assessment

For insightful teachers, the developmental continuum just described provides exciting evidence of Halliday's (1975) concept of children's meaning potential. An appropriate language and literacy curriculum in early childhood settings is one in which language and literacy potentials are valued by teachers in the same way as children's first utterances are welcomed and celebrated by families. Appropriate curriculum planning involves attention to all the dimensions of the learning environment and to relationships between home and school. The curriculum is organized around meaningful, integrated experiences facilitated by authentic assessment. Each of these issues is described below.

### *Functional environments*

Loughlin and Martin (1987) provide recommendations for creating a classroom environment that supports language and literacy. Their work documents the profound influence of the classroom environment on children's development (Loughlin & Suina 1982). They ask teachers to distinguish between the child's learning environment and the teacher's and to realize that environments must be viewed from the child's-eye view in order to be assessed appropriately. Many researchers document the importance of creating a classroom environment (Marrow & Rand 1991; Neuman & Roskos 1991).

***Immersing children in functional print.*** Loughlin and Martin state, "A key role of the functioning literacy environment is surrounding children with sym-

***CHILDREN MUST FEEL TRUST AND COMFORT AT SCHOOL IN ORDER TO TAKE RISKS WITH LANGUAGE.***

bols and print, making the literacy environment as constant and pervasive as the oral-language environment" (1987, 9–10). In addition to surrounding children with print, adults ensure that print is used for *real* purposes, as opposed to practice or ornamental purposes (Ortiz & Englebrecht 1986).

When early literacy researchers came to understand the intense effect of environmental print on emergent readers and writers, classrooms became flooded with print that was abundant but frequently nonfunctional. Teachers laboriously marked every chair and light switch with beautiful, laminated labels, sometimes in two languages. This labeling was done with the best of intentions, but we now realize that such print must be useful in the classroom. Attention must be called to print as a real resource for children and adults so that children are

> exposed to all these functions of literacy within the everyday interactions of . . . school life rather than within contexts constructed for instructional purposes. Hence . . . preschoolers (are) not so much surrounded by print as they (are) surrounded by adults who routinely choose to use print because it (is) effective in many contexts and for many purposes in their everyday lives. (Schieffelin & Cochran-Smith 1984, 8)

In such settings, print serves a variety of purposes for those who use it

- as a source of information (the schedule for the day, the alphabet, the lunch menu);
- as a source of pleasure or recreation (books, newspapers and magazines in a cozy corner, posted poems and song charts);
- as a means of recording (science observations, reflective logs, weather graphs);
- for communication with others in the setting or the school (a mailbox and post office system, message board); and
- for creating a strong tie between home and school (calendars and newsletters to share with families, written-language materials from home to use in school).

Each of these literacy events is surrounded by and encourages rich and appropriately related oral language use.

***Providing adequate resources and materials.*** Children are not able to make literacy purposeful and do not have reason to discuss a variety of literacy events if there are no materials available to meet their varied needs or if they do not have access to those materials (Wortman & Matlin Haussler 1989). Loughlin and Martin (1987) call this concern for availability and accessibility of resources "provisioning."

Early childhood classrooms are provisioned with essential materials to promote functional literacy. A classroom library must include a wealth of books of all types: fairy tales, fiction, storybooks, picture books, information books, alphabet books, and counting books. Books varying in genre, style, type of illustration, languages, and form allow children's concepts about reading books to grow. The recent surge of publication of children's literature, particularly in the nonfiction area, must be reflected in preschool and primary classrooms. Even the youngest children need opportunities to explore and study books. The library should also include newspapers, magazines, a wide range of reference books and other resource materials.

A classroom publishing center includes an assortment of types, sizes, and colors of papers; all kinds of writing and illustrating instruments; and bookmaking materials, such as wallpaper samples for covers, staplers, glue, scissors, binding machines, typewriters, and computers. Books, writing materials, and computers are, of course, available to children in all areas of the classroom in addition to the library and publishing center. These materials should be available for children at their eye level, not placed on high shelves or in cabinets and desks reserved for adult use.

The kinds of materials available and the ways in which children select different resources provide a means for assessing children's growth as a reflection of a range of social contexts. Table 1 summarizes the functions of literacy that are met through the use of a wide range of environmental print and written language sources in the classroom. The materials listed in this grid help teachers consider the variety of nonbook as well as book forms used for language learning in the real world. Incorporating these materials into the curriculum validates children's knowledge about print from home and helps them become consciously aware that print surrounds them everywhere in their world.

***Creating a responsible community.*** The classroom also is organized for functional purposes so that teachers and children can work together responsibly to develop a democratic community. Wortman and Matlin Haussler describe a kindergarten classroom in which "materials are organized so that the children can function without constant assistance from their teacher, and this accessibility aids learning" (1989, 49). When teachers include written language in the routines of

daily classroom life, children learn responsibility, the teacher is free to fill other important roles, and children come to realize the functional value of literacy events. For example, even very young children can record attendance, lunch counts, and calendar events. They can record their own academic progress and self-evaluations in folders and file them in alphabetical order. Young children can manage the classroom library, publishing center, and post office. During these events, talking, listening, and literacy learning are embedded in authentic purposes for daily classroom life rather than simply for instructional purposes (Milz 1982; McNamee 1990; Kantor, Miller, & Fernie 1992).

The emotional environment and the school climate have a tremendous impact on how literacy evolves in a school setting (Wortman & Matlin Haussler 1989). Children must feel trust and comfort at school in order to take risks with language. An effective emotional environment is established through the quality of negotiation that occurs in setting rules and behavior expectations and the amount of validation that children feel for the language(s), knowledge, and abilities they bring to school. Children's basic needs for safety and security, both physically and emotionally, are absolutely necessary for academic growth.

***Building a social community.*** Caryl Crowell, a whole language teacher in Tucson, Arizona, tells her third-grade bilingual students, "Talking is probably the most important thing we do in here, because you learn the most when you can talk while you work" (Whitmore & Crowell 1994). A rich body of literature is now available that tells us that language and literacy development, like all learning, occurs in a social context (Vygotsky 1978; Dyson 1987, 1989; Moll 1990). It is clear that children must be encouraged to talk while they read and write (Cairney & Langbien 1989; Barnes 1992; Wells & Chang-Wells 1992; Dyson 1993). Through rich oral interactions during conferences, at writing centers, and in reading lofts, library corners, and literature circles, children enrich their pools of knowledge about the ways in

***Table 1.*** CLASSROOM MATERIALS THAT SUPPORT THE FUNCTIONS OF LITERACY

| | *Materials* | | | |
|---|---|---|---|---|
| ***Functions*** | Books, magazines, newspapers | Research/problem-solving materials | Alphabetic and non-alphabetic symbols | Primary sources |
| Environmental | coupons<br>advertisements<br>book jackets | telephone book<br>recipes<br>directories | labels, signs, daily schedules, menus, posters, T-shirts, graffiti | messages<br>lists<br>bills<br>price tags |
| Recreational | literature genres<br>cartoons, comics<br>poetry<br>movie critiques | Guiness books<br>how-to pamphlets<br>video-game guides<br>model-building instructions | musical notation<br>word puzzles/games<br>jokes and riddles<br>computer games | tickets<br>scrapbooks<br>theater/sports programs |
| Occupational | want ads<br>stock reports<br>book reviews<br>job-improvement articles | professional literature<br>bibliographies<br>portfolios<br>webs | blueprints<br>graphs<br>manuals<br>eye chart<br>computer keyboards | memos<br>autobiographies<br>prescriptions<br>checks |
| Informational | weather/health/sports reports<br>biographies<br>nonfiction<br>news stories | definitions<br>encyclopedias<br>dictionaries<br>medical charts<br>guide books | maps, diagrams<br>toy boxes<br>photo albums<br>computer menus<br>calendars<br>clocks | birth announcements<br>receipts<br>invitations |

*Adapted from Y. Goodman & C. Burke,* Reading Strategies: Focus on Comprehension, *1980, 38. New York: Holt, Rinehart & Winston.*

which oral and written language work. To pull literacy "out of the network of peers is to deny children the opportunity to experience the tension between individual expression and social communication that is the living tension of language use" (Dyson 1987, 246).

***Creating a climate for play.*** Many of the examples of the developmental moments described earlier occur naturally during play. Vygotsky (1978) emphasizes the importance of play and its relationship to literacy, determining that early writing evolves through play and gesture.

Observations of Puerto Rican children's play at home demonstrate that they "take an active role during play to practice and elaborate (literacy) skills" (Jacob 1984, 80). For example, as three young girls play shopping, they write play money, make shopping lists, use the written papers as receipts, and then, after changing themes to playing doctor, change the meaning of their written-on papers to prescriptions.

Similar exchanges occur in early childhood classrooms. In preschools where authentic literacy artifacts are available as part of doll corners, stores, offices, and restaurants, children develop literacy as they write phone messages, shopping lists, receipts, and menus (Owocki 1995). Writing materials in dramatic play areas, in the block area—in all sections of the classroom—generate not only more writing but various authentic forms necessitated by various authentic functions (Wortman 1991). Play is important for all children, even beyond age 8, because it gives children opportunities to experiment with uses of writing, to invent freely, and to practice more approximate literacy behaviors in nonevaluative settings (Wasserman 1992).

## *Collaborating between home and school*

> Children acquire a vast amount of knowledge in an unbelievably short period of time while in close association with their parents. Then when children go to school, they take this knowledge with them. (Hill 1989, 83)

Early childhood educators are responsible for building on each child's knowledge from home. This necessitates redefining the traditional relationship between schools and homes. A relationship based on partnership and communication, with the mutual goal of providing children with supportive and successful educational experiences, must replace the common relationship marked by fear, intimidation, anger, and resentment between teachers, principals, and parents (Bredekamp 1987; Shannon 1995).

Teachers discover (through the qualitative means suggested in the assessment section) how language is being invented by each child in their classes. By recognizing children as unique individuals with unique literacy histories and valid knowledge about their worlds, teachers plan appropriate curriculum.

The benefit of valuing children's homes, experiences, knowledge, abilities, and insights occurs when we realize what resources children contribute to the social community of the classroom. Children's funds of knowledge, the intellectual part of what they know about the world that enables them to participate successfully at home (Moll et al. 1990), provide rich resources of information to use in the curriculum (Gonzales et al. 1993). Children's multilingual and multicultural capabilities expand exponentially the amount and type of resources that are available to classrooms during studies, through both written and oral texts (Moll & Whitmore 1993). These are resources that teachers and peers may capitalize on within the social networks of classroom communities.

Members of the home community will benefit from a closer relationship with teachers and schools, as well. Parents who are not intimidated by the school are more comfortable volunteering to help, learning *with* their children, and becoming a functioning and supportive member of the school community.

The issue of homework exemplifies both the traditional relationship between home and school and the potential for changing that relationship. Families in the 1990s have complex, busy lives. Parents work hard and often have difficulty finding time to spend with their children (Hill 1989). Family life may be nurtured and enriched, however, by homework assignments that are thoughtfully designed by partners from both the home and the school (Schickendanz 1990). Forcing children to fill in worksheets and practice for spelling tests wastes the valuable quality time that parents and children cherish. Instead, families can come together to read real books and talk about them, write real letters to family and friends and mail those letters, write shopping lists to read and to use at the store, cook from traditional and new recipes, and discover the wonder of the world with each other through a variety of means. Trips to the zoo; bike rides through the countryside; and attendance at fairs, plays, and baseball and soccer games are wonderful opportunities for rich language use in families and can be encouraged and legitimized as homework by the school. Teachers can organize book packs for children to check out to share with their families (Hart-Hewins & Wells 1988).

Schools or individual classrooms can develop themes for the year or month as topics of study at home, based on the children's questions, that families can investigate through a variety of means. These

types of projects and activities can be shared during family fiestas at school, when families can come together and learn from each other. Books "published" by families can be placed in the school library for circulation. Families can share their culture's music, art, toys, food, and games to present learning in a variety of ways. A supportive learning community develops as the school becomes a resource for the community and the home and community become resources for the school, fostering mutual understanding and respect for diversity.

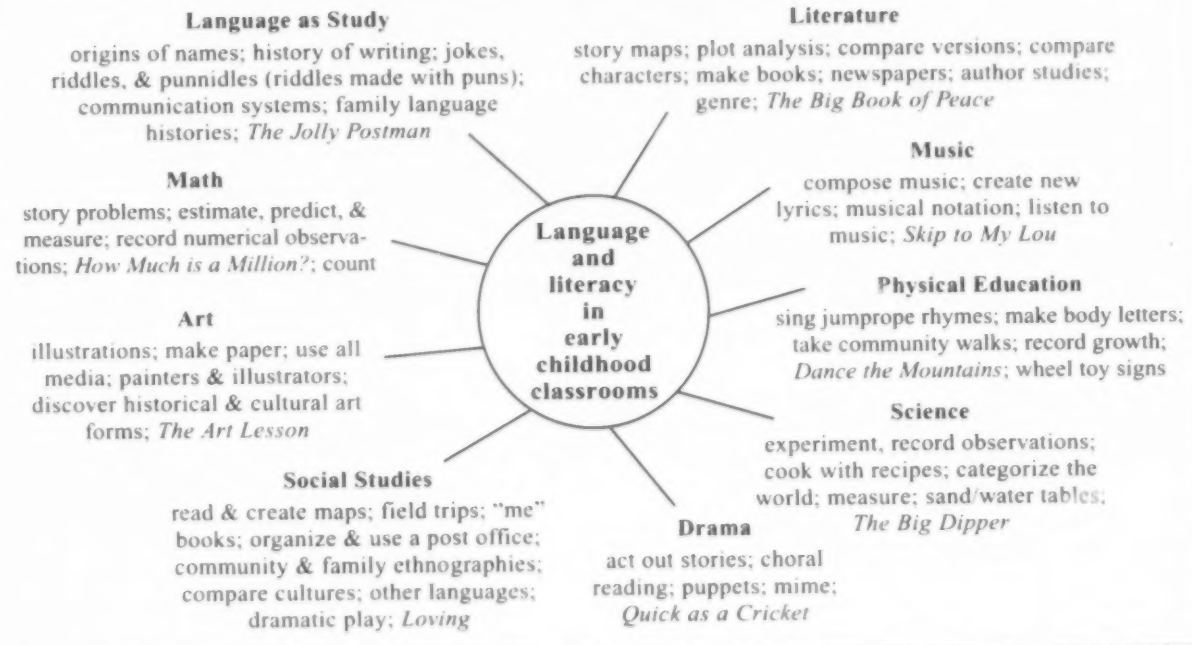
### *Reaching potentials through transforming curriculum*

Developmentally appropriate curriculum *must* begin with the children who are experiencing it, by exploring content, practice, and expectations through children's important questions as a classroom community. Children are naturally curious learners and investigators; they also have personal goals for their own learning. Beginning with individual and group brainstorming sessions, using techniques such as listing and webbing, teachers can help children categorize what they know and negotiate decisions on topics of study and learning activities (Whitmore & Crowell 1994). In this way, children's knowledge and questions direct the concepts of study for the year's curriculum through theme cycles (Edelsky, Altwerger, & Flores 1991) providing "a focal point for inquiry, for use of language, for cognitive development. [Such a curriculum] involves pupils in planning relevant activities within productive studies" (K. Goodman 1986, 31). (For in-depth discussion of thematic organization, see also Gamberg et al. 1988; Flores 1994; Harste, Short, & Burke in press.)

In whole language classrooms, children use speaking and listening, reading and writing in integrated ways to receive and express information, feelings, sensory perceptions, and ideas, and to play. As in real life, literacy and speech events occur in wholes, within active social contexts. Collaborative experiences are very important, yet children need time to develop their own interests and abilities through personal effort, to support the tension between personal invention and social convention. Whole language curriculum integrates all subject areas through both social and individual experiences (Strickland 1988).

We have depicted a wheel of opportunities for learning in the box below. At the hub of the wheel is language and literacy—central to any quality program. The spokes that travel out from the hub each represent the words *play, read, write,* and *talk,* reminding teachers that these are the means children use to engage in the knowledge from all subjects.

**Integrating Curriculum Through Language and Literacy**


Language and literacy in early childhood classrooms
Language as Study
origins of names; history of writing; jokes, riddles, & punnidles (riddles made with puns); communication systems; family language histories; The Jolly Postman
Literature
story maps; plot analysis; compare versions; compare characters; make books; newspapers; author studies; genre; The Big Book of Peace
Math
story problems; estimate, predict, & measure; record numerical observations; How Much is a Million?; count
Music
compose music; create new lyrics; musical notation; listen to music; Skip to My Lou
Art
illustrations; make paper; use all media; painters & illustrators; discover historical & cultural art forms; The Art Lesson
Physical Education
sing jumprope rhymes; make body letters; take community walks; record growth; Dance the Mountains; wheel toy signs
Science
experiment, record observations; cook with recipes; categorize the world; measure; sand/water tables; The Big Dipper
Social Studies
read & create maps; field trips; "me" books; organize & use a post office; community & family ethnographies; compare cultures; other languages; dramatic play; Loving
Drama
act out stories; choral reading; puppets; mime; Quick as a Cricket

Specific activities may be categorized in a variety of ways; many activities fit under two or more subject-matter headings. Cooking is a truly integrated activity, for instance. Children measure ingredients; observe chemical changes; describe processes; level, stir, and pour; read recipes and ingredient labels; and record insights and tastes as they cook. They engage in math, science, physical education, and language arts within an authentic experience. Literature, music, and drama are incorporated easily, too. Children's literature (such as *Strega Nona*) and songs often suggest cooking experiences and can be enjoyed after cooking as children relax and partake of their creations. When they cook, children use all their senses and engage their cognitive, emotional, physical, and social selves to learn holistically and with a purpose.

An excellent example of a whole-language theme generated by children's natural interests and knowledge and developed because of knowledge about their sociocultural history and experience is a theme that was facilitated by a teacher at a Pueblo school in rural New Mexico. Christine Brennan had frequently observed her upper-elementary Native American children after school, engaged in activities involving birds. She watched the children as they observed birds, shot them and cooked them over small fires to eat, used their bones for a variety of purposes, and sold their feathers to the elders of the community for traditional clothing and art. The teacher also noted the prevalence of birds as a design in local pottery and cultural artifacts in the community. She used the rich experiences of the children and their families to help them build an integrated theme cycle that validated and extended their knowledge.

During the theme, the children use reading, writing, listening, speaking, and playing to study birds. They study the importance of birds as symbols in their own culture and the cultures of other groups of people. They learn about the eagle dance, an important part of their traditional ceremonial life. They explore the habitats of birds, the possibility of their extinction, and the types of birds around them by hiking and bird watching, writing to bird protection organizations, and talking to local experts. Experiments with feathers, gravity, and flight are extended with written observations and record keeping. Feather and nest collections are categorized and counted. Song birds are recorded and listened to. Owl pellets are dissected. Arrows are made and flown, using feathers to control their movement. Bird legends and stories are collected, many shared by the community members and others found in children's literature. Words, metaphors, and sayings that originated through connections to birds are listed and used in writing. Illustrations, pottery, sculpture, wood burning, and other art forms are created using the children's growing knowledge about birds. The theme culminates with the children reading *The Great Race* by Paul Goble (1985) and comparing and contrasting his written and illustrated texts with the information the children acquired during the course of their study.

Teachers who develop rich, holistic, authentic learning experiences like these, based on their knowledge of their students, meet Elkind's recommendation that "curriculum should never be final but always open, flexible, and innovative. That sort of curriculum is exciting for the teacher as well as for the pupils and makes the learning and curriculum innovation a cooperative venture" (1991, 11). As the theme about birds shows, whole language curriculum enables children to reach their potentials in all areas of language development without needing to know fully, in advance, what those potentials specifically are. Building on strong theoretical beliefs and current understandings about how children learn, and on knowledge about what individual children know already, teachers and children collaboratively develop realistic and high expectations.

Children's personal inventions move toward social conventions, no matter what their stage of development or what issues they are currently wrestling with. However, the language and literacy experiences that children bring from their sociocultural backgrounds may or may not be compatible with the experiences they will be asked to participate in at school. Developmentally appropriate curriculum must accommodate diversity (Derman-Sparks & A.B.C. Task Force 1989; Bowman 1992); it begins with children's unique inventions, their home language and culture, and provides children with authentic functions and audiences for language and literacy use. Developmentally appropriate programs provide opportunities and experiences for young children that enable them to reach their potentials at school, ensuring that they build successful personal literacy histories.

### *Assessing language and literacy development*

Evaluation has become a primary concern of early childhood educators, especially as they attempt to bring together authentic evaluation and holistic curriculum trends (Y. Goodman 1991). Evaluation in school should mean assessing development. Unfortunately, evaluation has frequently come to mean reducing definitions of people to scores, numbers, or labels. There is an attempt to achieve some mythical "objec-

tive" and "standardized measure" for comparing children and assessing growth. Most often children are judged by what they do not know or cannot do (Elkind 1991; Taylor 1991, 1993; Tierney, Carter, & Desai 1991; NAEYC & NAECS/SDE 1992).

The examples of the developmental continuum presented in this chapter may occur in a variety of contexts and will occur only if there is opportunity for them to exist, to flourish, and to be noticed. When teachers evaluate, they see what they know; and their observations are filtered through their ideas about how language and literacy develop. The developmental continuum described above occurs in supportive, authentic, functional settings (most likely at home or in developmentally appropriate school settings). Therefore, a discussion about evaluation is virtually impossible to separate from development itself and the curriculum that supports it. In fact, there are many statements and implications about evaluation and developmentally appropriate curriculum in the previous discussion.

Much of the knowledge about young children's language and literacy development has come from *kidwatching* (Y. Goodman 1978, 1985). Kidwatching means observing children, with a knowledgeable head, and focusing on children's strengths; it leads to designing open-ended tools to assist with recording evaluative information. For example, when children encounter print in their environment—on cereal boxes in the class store, on the class schedule, on each other's T-shirts, and in books—kidwatchers observe children's print awareness and record information that is important to remember for later use. (See Goodman, Altwerger, & Marek 1989 for a complete discussion of how to record and evaluate print awareness.)

Kidwatching answers the question, How does what children say and do show us what they know about oral and written language? Kidwatchers talk with children and listen to them speak and read. They ask children to explain what they are doing with language, interview them in an open-ended fashion, and closely observe reading and writing activities. With records of the information gathered through these interactions, teachers can answer questions about a child's individual developmental continuum and gain insight into children's mental processing (Dyson 1985; Barrs et al. 1990; Taylor 1993). Then, based on trust that children become capable language and literacy users in rich language environments, effective kidwatchers find ways to extend children's successes into new areas.

Many teachers are particularly interested in children's development of invented spelling strategies (Gentry 1987). These teachers need to sit with the children as they write (or audiotape them), because it is impossible to determine, by looking only at written products, why children make selections for written forms. By listening to children talk as they write and think out loud, by watching as children make revisions and changes in their writing, and by asking them "I wonder why . . . ?" questions, teachers increase their understanding about children's abilities and knowledge.

***BY LISTENING TO CHILDREN TALK AS THEY WRITE, BY WATCHING AS THEY REVISE THEIR WRITING, AND BY ASKING THEM QUESTIONS, TEACHERS LEARN MORE ABOUT WHAT CHILDREN KNOW AND WHAT THEY CAN DO.***

In the recent explosion of interest in interpretive assessment methods, a wealth of helpful tools and strategies are being developed by teachers (Chittenden & Courtney 1988; Goodman, Goodman, & Hood 1989; Cambourne & Turbill 1990; Goodman, Bird, & Goodman 1992). Some of these tools are in-depth analyses of oral and written language, such as the *Primary Language Record* (Barrs et al. 1989), miscue analysis (Goodman, Watson, & Burke 1987; Martens, Goodman, & Flurkey 1995), and focused analysis of spelling development (Wilde 1991). Observation and anecdotal records, self-evaluations, and portfolios are three useful assessment strategies.

***Observation and anecdotal records.*** Teachers who are kidwatchers are constantly informally observing and assessing as they help children with learning activities and interact with groups of children. Their observations may also be more formal and systematic, as they assume the role of a learner about children. Observations may be recorded through a variety of techniques, ranging from notecards and notebooks, to more extensive checksheets and forms, to computerized systems (Barrs et al. 1989).

Maureen Morrissey, a bilingual whole language teacher, expresses the value of keeping anecdotal records in relationship to teachable moments: "In any classroom teachable moments happen often, and with them the *evaluative moment,* because the two are so closely associated that they are inseparable . . . . The teachable or evaluative moment is a growth point, a window of spontaneous insight for both my students and myself" (1989, 87, emphasis in original). Morrisey uses anecdotes to record the occurrence of second-language use and movements into convention in written language production. Teachers' individual goals and insights are reflected in the types of observations they select to record and consider.

***Self-evaluation.*** Asking children to reflect upon their own development and assess their learning and growth is invaluable for gaining perspective on thinking and language processing. Children may self-evaluate in writing, orally, or both. Children may be asked to respond to questions such as, What do you do when you come to something you don't know while you're reading? How do you decide on a topic when you write? What types of materials do you like to read? What piece of writing represents your strengths as a writer, and why? What plan do you have for improving your reading/writing? How are you a good listener when your friends are talking? How are you a participant in your literature study group or when your teacher reads or tells a story? These types of questions will be easier for children to respond to when they are immersed in language and literacy experiences that provide them with (1) something important to talk about—i.e., authentic experiences with real materials—and products from those experiences; (2) the language of reflection and the time to reflect; and (3) the confidence and security to take a risk with their reflections.

***Portfolios.*** Portfolios provide an opportunity for children and teachers to collect the artifacts of their language history as it is being created (Graves & Sunstein 1992; Taylor 1993). Collections of widely varied transcripts or tapes of oral language experiences, writing and reading samples, as well as reflections about them and revisions of them "not only chronicle the development of the student's thinking but also show the result of instructional interventions. Through a wide collection of student work, assessment is able to be descriptive and continuous" (Tierney, Carter, & Desai 1991, 66). Portfolios may include writing products, both first and revised drafts; audio- and videotapes of children's reading, presentations to peers, discussions, conversations, and debates; and a range of artwork. Self-evaluation is the key component of portfolios. Children may select the examples they want to include in a portfolio to go home and then write a letter or produce an audiotape explaining to their parents why they selected the examples to share.

Many of the techniques used in conducting ethnographic research help teachers come to know the children, their backgrounds, their languages and their culturally learned values about literacy (Heath 1983; Gonzalez et al. 1993). The ethnographic techniques of participant observation and interview enable teachers to build an understanding of each child in terms of his or her own cultural and social history through qualitative means, rather than through measures reduced to single numbers and out-of-context performances. Home visits, interviews with children and parents, and participation in community events, in addition to participant observations in the classroom, place children in a broader social, cultural, and historical context (Barrs et al. 1989).

Recent focus on ethnography and interpretive evaluation shortens the gap between evaluation and research. Teachers are realizing that they are researchers in their classrooms as they strive to complete thorough, reflective, and professional evaluations of children's development (Pinnell & Matlin 1989; Cochran-Smith & Lytle 1993; Patterson et al. 1993). Researchers are learning to value the functioning classroom as a source of information for theoretical understanding, realizing that practice is indeed informing theory in many instances (Hydrick 1991; K. Goodman 1992; Moll & Whitmore 1993). Most of what we come to know about how children read, write, and talk we learn from the children themselves. Teachers, researchers, and children collaborating on assessing development provides the most helpful possibility for increasing our understanding of how children develop literacy.

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# 12 Transforming Curriculum Organization

*Sue Bredekamp and Teresa Rosegrant*

Throughout this book and in the NAEYC & NAECS/SDE guidelines (1992), we define learning as understanding; in understanding, the focus is on meaning. The purpose of this chapter is to explore ways that the organization of early childhood curriculum can be transformed to ensure that the important goals of the discipline standards are achieved through meaningful learning experiences. Young children are meaning makers. Anyone who has ever observed an infant for any length of time cannot help but see that human babies, virtually from birth, show remarkable interest in their environment—how things work, what they are, how they relate to one another, where they come from. This quest for better and deeper understanding of the elements of the world—the attempt to make meaning—continues through early childhood unless adults thwart it in some way. Unfortunately, the traditional subject-matter curriculum, which leaves children responsible for making all the connections, can be too kaleidoscopic or too trivial for children to develop understanding—a situation that national subject-matter standards could exacerbate rather than mitigate.

The national standards movement serves an important purpose by motivating discipline-based experts and organizations to define and delimit the essentials of their discipline—identifying important content and answering the questions, What should children know and be able to do, and when? The necessary dialogue for achieving consensus within subject-matter groups regarding these difficult questions has been valuable by helping specialists focus on key concepts that can be used to guide the practice of teachers, who are usually generalists, at least in the early grades. But this important work has a downside, as well. The standards movement, which now encompasses all of the subject matter disciplines, results in an overwhelmingly large, disconnected matrix of content, skills, and processes (as we have seen in this book) that is proposed as the content of the curriculum.

If the curriculum matrix is to become not just manageable but also meaningful for children, the dialogues that have gone on within disciplines now must occur between disciplines. Even a brief examination of the national standards reveals that there is insufficient time (in a day, a year, or even across the years of early childhood) to fully "cover" the curriculum matrix. The time pressure may lead to the "hurried curriculum," a corollary of the "hurried child" (Elkind 1988). Children who are developing at different rates or whose styles of learning differ from the teacher's own style are left behind, and even the most academically adept students are likely to learn much of the material superficially. Unless a serious dialogue occurs regarding what can and should be integrated, as well as what must be separated, the standards movement will stall. Given that it is impossible to cover everything, the

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tension must be relieved in some way. If serious transdisciplinary work does not occur to address the dilemmas of coverage versus mastery and integration versus separation, teachers and curriculum developers will probably resort to reductionism—the often-repeated error of watering down, simplifying what is taught, to the point where intellectual integrity, meaningfulness, and other goals of the standards are threatened or lost.

Curriculum is like a lifeboat; it can hold only so much or it will sink. As more and more is added, a choice must be made: We can add slimmer, lighter weight versions of everything, thus necessitating rote learning, or we can identify a coherent set of understandings that are broader and more likely to generate new learning. When discipline organizations load the curriculum with hundreds of specific objectives, as do some of the sets of national standards, they risk swamping the lifeboat. The solution is to begin with the discipline frameworks and identify the connections, the ways that curriculum can be integrated and made more meaningful for learners.

Integrated curriculum is the obvious answer to achieving coverage while also promoting meaningfulness, but integration carries its own risks. In this chapter we first define integrated curriculum; then we discuss the risks as well as the potential benefits of curriculum integration, strategies to promote integrated curriculum, and contextual models of classrooms that support integrated curriculum. We then revisit the topic of planning curriculum, with specific emphasis on the content of the disciplines. We conclude the chapter (and the book) by relating the concept of curriculum integration to the theme of reaching potentials of all children. (Many of the ideas presented in this chapter, including in-depth examples of curriculum planning, are described in more detail in Chapter 6 of Volume 1 of *Reaching Potentials*.)

## Integrated curriculum defined

The subject-matter disciplines represent branches of knowledge; each provides unique methods of constructing knowledge, ways of representing what is known, and systems for organizing knowledge. Each discipline describes a specific course of study relevant to its specialized field. The curriculum typically includes the overall course of study across all the disciplines. Integration of curriculum can be accomplished in many different ways; at most levels, integration is the process of bringing the parts into a whole, creating Venn diagrams in which areas of overlap become apparent (indicating areas where integration is possible) and identifying where minimal overlap exists (thus, requiring separate attention and focus). Just identifying overlap is an insufficient strategy for integrating early childhood curriculum, however. The primary purpose of integration is to make curriculum more meaningful for young children. Therefore, we define integration as providing an organizing topic or concept within children's range of experience that allows children to explore, interpret, and engage in learning activities that draw on goals from one or more subject-matter disciplines. Integration is the strategy to make curriculum content meaningful for young children.

Curriculum integration is a highly valued construct in early childhood education, and it is now being applied with older children and adults (Shoemaker

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1991). In fact, one of the potential benefits of the national curriculum standards movement may be the connections that can be made between levels of education, from early childhood to middle school to high school (Council for Basic Education 1994). This can be a positive trend as long as the result is not to push down to preschool the way in which subject matter is taught at higher levels but rather to promote a more constructivist view of learning throughout the course of education.

The concept of integration during early childhood derives, in part, from the integrated nature of development—what happens in one domain of development (such as physical development) inevitably influences development in other domains (such as social and emotional). But the value of integrated curriculum is most powerfully supported by the research on brain development that indicates the degree to which the human brain functions optimally when processing meaningful information (Caine & Caine 1990).

Although a variety of approaches are used to integrate curriculum (Fogarty 1991), the ones most common in early childhood classrooms are the project approach (Katz & Chard 1989) and the theme approach, most effectively developed through what is called *webbing* (Krogh 1995). In the project approach, children engage in extended investigations of a problem of interest that has sufficient depth to address curriculum goals from several disciplines. As Katz points out, "The key feature of a project is that it is a research effort deliberately focused on finding answers to questions posed either by the children, the teacher, or the teacher working with the children. The goal of a project is to learn more about the topic rather than to seek right answers to questions posed by the teacher" (1994, 1).

Webbing provides a planning strategy for teachers and children who begin with an interesting theme of study and build a web connecting that topic to others, which often cut across the disciplines or around areas of child development. For toddlers and preschoolers, constructing a web around areas of child development is a particularly valuable strategy to ensure that the learning experiences address the needs of the "whole child." What each of these approaches has in common is its focus on meaningfulness. Projects, topic of study, and other strategies for conceptually organizing curriculum are designed to build children's interest and to help them begin to apply what they learn to solve meaningful problems.

## The risks and benefits of integrated curriculum

In making decisions about integrating curriculum, it is important to ask two related questions: What can be connected, and what must be separated? One of the risks of overly integrating curriculum is losing clarity about the uniqueness of each discipline and, therefore, losing sight of the contribution that the discipline makes to ways of knowing and ways of representing knowledge. An additional risk of having an integrated curriculum is losing sufficient engaged time in the disciplines. In some ways the competition for the curriculum is really a fight for time on task. Math experts are wary when they hear early childhood teachers say, "We do math everywhere." The math experts are justifiably concerned that unless teachers focus on math concepts and processes, some children will not acquire adequate understanding, and most children will

not be able to identify the core concepts of mathematics within the integrated study. Similarly, art often is found in early childhood classrooms as a way of integrating curriculum, but too often the integrity of the discipline and the children's ability to use the tools and processes used by artists are lost.

Despite the risks inherent in integrating curriculum, the benefits of curriculum integration, especially for young children, seem to outweigh the risks. Why integrate curriculum? Integrated curriculum promotes learning in at least six important ways:

**1.** Integrated curriculum provides coherence for children's experiences and contributes to their construction of meaning. Topics of study can be identified by the teacher but are often most engaging if they "emerge" from the children's interests, passions, or personal experience (Jones & Nimmo 1994). Children are more likely to engage with mathematics, for example, when they are using it to solve a problem that is important to them, such as how to build a life-size model of a dinosaur (Rankin 1993). When children engage in integrated, meaningful studies, they can communicate with family members and friends about what they are doing in school and what they are learning; hence, connections are made between experiences in school and at home. A Louisville, Kentucky, preschool class, excited by Derby Week, may engage in an in-depth study of horse breeding in the state. After alarming media accounts of threats to native sea turtles in Hawaii, a class may launch a study of endangered species on their island. In either case, children learn knowledge and skills, such as classification, through meaningful content. They can talk at home about what they are learning about horses, sea turtles, or anything else, even though they cannot converse about the discrete skills that they are learning, such as classification or seriation.

**2.** When curriculum areas are isolated from one another, children are unable to see each area's contributions to the broader knowledge base. Disciplines seem narrow in applicability rather than of broad relevance. When children's study of mathematics is limited to math lessons, even if manipulative materials are available, children may fail to see how math is useful in everyday life. Mathematical concepts and problems arise in virtually every course of study: How many times each day does a bird eat? How long does it take migratory geese to travel from Canada to Maryland? How much food should be prepared for parents' night, and how will the tasks be divided? How many cars and adults will be needed for the class to travel in groups of four on the field trip to the planetarium? These real-life questions or problems can be the impetus for applying math facts.

**3.** Most disciplines today cannot be learned or used in isolation from other disciplines. To do science requires mathematics. To study literature requires knowledge of history, as does art. For young children, the connections are more specific but no less powerful. For example, second-graders' study of birds, usually under the rubric of science, introduces the concept of migration, which involves geography and mathematics: measuring distance and time.

**4.** Integrated curriculum can help minimize the number and abruptness of transitions, such as shifting from math to reading to physical education. The younger the children, the more difficult transitions are, whether they involve physical moves or mental gear shifts. Transitions often involve waiting and waste time that is better spent engaged in learning (Karweit 1983; Diffily 1991).

**5.** Integrated curriculum also helps organize into meaningful concepts the large amount of information children must learn. Too much disconnected content leads to pressure to cover the curriculum; insufficient time for learning, thus arbitrarily creating fast and slow learners; and overemphasis on external motivators. When time is the driving force for teachers and children, the desire to cover the curriculum or pass the test replaces the time needed to construct knowledge and the desire to know. Young children need repeated experiences with familiar concepts to gain mastery, and such opportunities come from thoughtful organization, not from a chaotic race to the next topic.

**6.** Children are more likely to learn what it means to be an expert in a discipline—a mathematician, scientist, writer, or social scientist—if they are able to see how that discipline contributes in a specific problem-solving situation. In the case of the migratory birds mentioned above, the teacher might challenge one child to be the mathematician and identify questions a mathematician might ask. Another child may approach the bird study as an artist, such as Audubon, whose art actually informed science.

## Strategies that promote integrated curriculum

Convinced of the efficacy of integrated curriculum and confronted by the sheer volume of disciplinary standards, curriculum planners and teachers need strategies to make connections across the diverse disciplines. We offer four general strategies to promote integrated curriculum. These are tasks in which adults must do careful thinking, but children can also be involved, especially in the primary grades.

**1. Use authentic assessment strategies that conform to the NAEYC and NAECS/SDE (1992) guidelines for appropriate assessment (see pp. 16–17 of this book).**

Assessment drives curriculum. Teachers often lament this fact because traditional multiple-choice or one-word answer tests tend to narrow curriculum to decontextualized academic skills. However, more authentic assessment strategies—teacher observation, portfolios, three-way conferencing (teachers, parents, and children)—provide excellent tools to support integrated curriculum, as described in Chapter 11. For teachers to observe children's problem-solving behavior and social interaction, children must engage in solving real problems or negotiating social situations with peers. For teachers to collect, analyze, and evaluate children's work over time and use portfolios adequately, children must engage in the production of meaningful products (representations, journals, project work). Recently, progress has been made on development and use of more appropriate, authentic assessment strategies (Hills 1993; Schweinhart 1993). For example, the Work Sampling System (Meisels 1992, 1993) is a complete assessment system designed for preschool through third-grade classrooms or schools that use integrated curriculum to help children learn important knowledge and skills from the disciplines. This system includes developmental checklists, portfolio collection, and summary reports for parents that are framed around seven domains of development and learning: personal/social development, language and literacy, mathematical thinking, scientific thinking, social and cultural awareness, art and music, and physical development.

**2. Identify interesting topics of study or problems to solve that lend themselves to lengthy observation, exploration, and investigation and that provide opportunities to explore rich content across discipline areas.**

Throughout this book, authors suggest general topics or identify projects that encompass content from multiple disciplines. These projects allow for in-depth investigation involving a whole class, a small group, or an individual child. Projects may take days, weeks, or even an entire program year, depending on the range of questions that arise in the project, the degree to which the children maintain interest, and the learning outcomes that the teacher is able to observe. Studies of personal or environmental health, for example, provide opportunities to learn science concepts, to read and write about what is learned, to gather and analyze data, and to apply the learning to meaningful problems in society. The social studies, especially geography and history, provide rich opportunities for children to engage in in-depth study of their community and its past. Such study can be especially meaningful if it is culturally relevant for children, as well.

***CONVINCED OF THE EFFICACY OF INTEGRATED CURRICULUM AND CONFRONTED BY THE SHEER VOLUME OF DISCIPLINARY STANDARDS, CURRICULUM PLANNERS AND TEACHERS NEED STRATEGIES TO MAKE CONNECTIONS ACROSS THE DIVERSE DISCIPLINES.***

**3. Identify powerful principles or concepts that are applied across disciplines.**

Selecting key principles or concepts to connect curriculum is a well-known strategy in early childhood education. One of the more commonly used curriculum models, the High/Scope Curriculum, relies on key experiences as a framework for developing understanding (Epstein, Schweinhart, & McAdoo 1995; Hohmann & Weikart 1995). Other well-known and widely used curriculum models—such as the Bank Street approach (Mitchell & David 1992) and the Creative Curriculum, originally designed for preschool and then expanded into the primary grades (Dodge & Colker 1992; Dodge, Jablon, & Bickart 1994)—also emphasize applying concepts across disciplines.

One example of a concept that applies across disciplines, taken from the mathematics standards (NCTM 1989, 60), is the study of patterns and relationships. In kindergarten through fourth grade, an objective is for children to recognize, describe, extend, and create a wide variety of patterns. Understanding patterns and relationships is not just a math skill, however; patterns are also important in art, music, physical education, science, and language. The concept of patterning can be used as an integrating concept to link subject matter and help children make connections between what they have learned in one area and new learning in another.

Another example of a cross-disciplinary concept is literacy. Even a cursory examination of the goals put forth in Chapters 4 through 11 of this book reveals the consistent reliance on "literacy" as the overarching goal of numerous disciplines; scientific literacy and health literacy are the goals of those disciplines—even physical education draws on the literacy theme by calling for "literate movers." A preeminent goal of all early childhood education is for children to acquire language and literacy for social communication and personal expression. Acquiring the ability to read and write, listen and speak is the ultimate outcome, but

these abilities are more easily acquired when children have coherent, meaningful content to write, read, and communicate about, as illustrated on page 161.

**4. Identify processes that are generative (i.e., that support the development of new ideas and concepts) across disciplines.**

An obvious example of a generative process that is fundamental to one discipline but applicable to many is the scientific method. Formulating hypotheses, making observations, collecting data, and revisiting hypotheses are processes that define project work of all kinds. Learning to use the scientific method may be a goal of science curriculum, but it also applies to health, math, social studies, and other curriculum areas that require problem solving.

Another process with application across disciplines is representation. Children use representation in various forms and structures in art, music, writing, geography, mathematics, even physical education. Early childhood educators now have greater understanding of the role of representation in learning (Copple, Sigel, & Saunders 1984; Forman 1993). When children use various media to represent what they know, the process of representation has the potential to not only reflect what children understand but to transform their thinking.

Numerous other processes can be cited that connect various disciplines. In the study of geography, scale models and other representations (e.g., maps, globes) are created and examined; and many forms of representation are used in science, mathematics, and health. Likewise, engaging children in accumulating collections (e.g., leaves, bugs, buttons, salt and pepper shakers) draws on one of children's natural interests and can be relevant to a variety of disciplines (science, social studies, mathematics, art). Children naturally count, classify, and sort objects that are part of collections; they identify patterns; they can also make inferences about historical periods by examining collections of objects.

The range of possible strategies for integrating curriculum is vast. The possibilities are limited by several factors, primarily the accessibility of direct experience with the content, which is directly affected by the learning context itself, to which we turn now.

## Contextual models of classrooms that support integration

Any of the strategies for integrating curriculum presented above depend, at least in part, on what materials, equipment, and experiences are available for children. In other words, the degree to which curriculum can be integrated is influenced by the context within which learning occurs. The traditional context for learning in school is, of course, the classroom. Schools, especially schools for young children, do not limit the concept of the learning context to the traditional view of classrooms. Instead, teachers look to other models for organizing knowledge in conceptualizing the context for learning. These contextual models include the library, laboratory, field, and museum. Early childhood classrooms incorporate elements of all these learning contexts.

The whole language approach to teaching literacy has had the effect of turning early childhood classrooms into libraries. The model of the classroom as library draws on the current dynamic view of libraries, not as repositories of past learning, but as generators of new knowledge and as settings in which people socially construct knowledge. Integrated curriculum requires direct access to books, both story and resource books, to support children as researchers. In addition, in such classrooms children create their own books, learning logs, and other records of projects. Today's libraries are not limited by the printed word, however, and rely on the almost limitless range of information available through technology. Computers with relevant, age-appropriate software and other technology become valuable tools in many early childhood classrooms, greatly expanding the possibilities of children's firsthand experiences.

Another valuable way to view the early childhood classroom is as a laboratory. The classroom can provide numerous naturally occurring as well as contrived events for children to study. In school, the lunchroom attendance is taken every day, but this simple event can be transformed into a serious project. Third-graders can conduct a nutritional study of the lunchroom, predicting how much and what food their peers will eat and analyzing the nutritional content as well as the amount of waste. Children at every age level can engage in recycling studies that involve more abstract concepts over time. Third-graders do not just count the number of cans and bottles to recycle but calculate the weight in pounds and other measures.

The laboratory context for learning encourages children to generate hypotheses, make predictions, collect data, revise their hypotheses, and otherwise engage in the work of serious researchers. But scientists of all sorts also engage in field work, and the classroom context must be expanded to encompass outside fields of study—the larger school, the yard, the community, the town. Seeing the "field" of study as the broad context within which children live and learn exponentially increases the potential topics for study and the possibilities for promoting interest.

A final way of rethinking the classroom context is the museum model. Gardner (1991) proposes the model of the modern children's museum, with its opportunities for hands-on learning in meaningful context, as one of the most effective ways to build classrooms that reflect what cognitive scientists know about how children think and learn. Encounters with the preschools of Reggio Emilia, Italy, further expand the American view of the museum model by demonstrating the power of developing museum-quality documentation of children's projects (Comune di Reggio Emilia 1987; Edwards, Gandini, & Forman 1993). In Reggio Emilia, documentation is not just a public display of products, as some American visitors assume; rather, documentation is an integral part of the process of learning, reminding children of approaches they tried previously and helping them revisit their prior experiences for further elaboration.

Early childhood teachers need not choose one of these models to enhance the classroom context for learning. Instead, they should see the classroom as library, laboratory, field, and museum—all good methodological approaches to capturing the potential of curriculum integration for promoting meaningful learning.

## Planning curriculum with the content of the disciplines in mind

In Chapter 6 of Volume 1, we described two examples of integrated curriculum in some detail—a preschool study with shoes as the conceptual organizer and a second-grade class's projects on birds. We will now revisit those topics to identify the role of the discipline standards in planning and implementing curriculum.

The shoes study (Bredekamp & Rosegrant 1992, 84–87) was originally observed in a class of young preschoolers, but the topic has sufficient integrity, interest, and depth to be applied with 4- and 5-year-olds, as well. Shoes were selected as a conceptual organizer because the topic meets several criteria:

1. Preschoolers are naturally interested in the topic (young children love getting new shoes or dressing up in adults' shoes).

2. Children can have direct, personal experience with the topic (putting on and taking off shoes occurs numerous times in a preschool child's day).

3. The topic encourages social interaction (shoes are a natural topic of conversation, and buying shoes is a social exchange).

4. The topic relates to child development (for example, fostering independence, fine and large motor development).

5. The topic provides many forms of participation for active engagement (such as visiting shoe stores and playing shoe store).

6. The topic promotes the acquisition of knowledge and skills, a description of which follows.

The last criterion is where the discipline-based standards can be introduced into the planning process. At the research and recording stage of the planning process, teachers analyze a topic from the perspective of the content of the disciplines and articulate what specific knowledge and skills children can acquire from the learning experiences. In addition to achieving the general developmental and learning goals listed in Volume 1, the shoes study provides opportunities to infuse specific content from the national standards, as listed below:

**Mathematics:** number sense and numeration (counting by ones and twos, grouping); measurement (shoe sizes, ordering); statistics and probability (collecting, organizing, and analyzing data about different shoe sizes or types); patterns and relationships (shoes of same types can create patterns; shoe designs are in patterns)

**Science:** technology (tools used to make or repair shoes); materials and manufacturing (some materials are stronger and better for making shoes or for cushioning feet); structure of matter (shoes can be described in terms of the materials they are made of and their physical properties)

**Physical education**: fundamental motor skills (walking, running, jumping, and hopping can be practiced with and without shoes; demonstrating how equipment supports practice of motor skills)

**Language and literacy**: vocabulary (types and materials of shoes); communication (scripts for playing shoe store)

**Health:** concepts related to health promotion and disease prevention (wearing shoes to protect feet from injury or in inclement weather)

Also evident in the shoes study are social studies content standards, such as the principles of economics displayed in the shoe store or the functions of shoes in relation to various occupational roles or different weather conditions. Numerous songs and rhymes related to shoes introduce music content, as well, and children can use various art media to depict types of shoes with which they are familiar. The topic is especially rich because so much content can be gleaned from it, but teachers must be sure that this potential for learning is achieved.

***CURRICULA FOR YOUNG CHILDREN MUST INCORPORATE IMPORTANT CONTENT AND PROCESSES (WHAT DISCIPLINE EXPERTS AND ADULTS, IN GENERAL, AGREE ON) INTO MEANINGFUL, CHILD-CENTERED LEARNING EXPERIENCES (WHAT CHILDREN ARE INTERESTED IN KNOWING AND LEARNING ABOUT).***

In Volume 1 (Bredekamp & Rosegrant 1992, 89–91), we also visited a second-grade class that was deeply engrossed in systematic study of birds. The visit revealed the outcome of the teacher's planning process and the many ways that children's emergent ideas and interests contributed to the development of the curriculum. Integrated curriculum, illustrated in this example and a similar one on page 162, offers many opportunities for children to achieve the knowledge and skills identified in discipline standards, as described in the following:

**Science:** exploring the scientific enterprise (closely observing birds is interesting and valuable, but the needs of living things must be emphasized, including the care of birds in the classroom); the living environment (including concepts about the diversity of life, heredity, and the interdependence of living things); constancy and change (the life cycle of birds) (AAAS 1993)

**Mathematics:** problem solving (using mathematics to answer many questions from bird study, e.g., how far or fast birds travel, how much they eat, how long they live); measuring (distance of migrations)

**Music**: listening to, analyzing, and describing music (using tapes of bird songs and calls); improvizing of melodies, variations, and accompaniments (children can invent their own bird songs using various instruments and their voices)

**Art:** using different media, techniques, and processes to represent birds (based on observations of birds); selecting and using symbols to communicate meaning (discussing how and why birds are used as symbols, such as the American bald eagle or state birds); analyzing the depiction of birds in well-known works of art from various cultures and historical periods

**Social studies:** considering how birds' nests and people's homes are suited to the various physical environments in which they are built; mapping nearby places where birds live, or taking a trip to a zoo

**Language and literacy:** writing and reading fiction and nonfiction works about birds

A topic such as birds lends itself to whole class activities, such as a trip to the zoo, and also to small group projects, such as bird observation walks. The Amusement Park for the Birds, built in the yard of La Villetta School in Reggio Emilia, Italy, demonstrates the huge potential of the topic of bird study to inspire children's interest and thinking (Reggio Children 1995). A schoolwide project that has lasted several years, the Amusement Park for the Birds led to many in-depth projects, such as constructing fountains, creating a beach, and building a bird observatory. Not only is a bird study an engaging topic that children can experience firsthand on many levels, it also provides opportunities to directly infuse important content from a variety of disciplines in the early childhood curriculum.

## Reaching potentials of all children

In working on the second of this two-volume exploration of appropriate curriculum and assessment for young children, we (the editors) were again struck by the tension that often occurs in early childhood education—the tension between what adults determine that children need to know and be able to do and what children may be interested in learning and want to do. This tension is sometimes characterized as the choice between programs being either teacher-directed or child-centered. More than ever, we are convinced that this is a false choice. The best solution to this tension is for early childhood educators to recognize that curricula for young children must do both: objectively incorporate important content and processes (what discipline experts and adults, in general, agree on) into meaningful, child-centered learning experiences (what children are interested in knowing and learning about).

By recognizing that both adults' and children's views must be considered, we resolve the choice between the "early childhood error" (inadequate attention to the content of the curriculum in preschool programs) and the "elementary error" (overattention to curriculum objectives, with less attention to the developmental characteristics of young learners or the specific needs and interests of individual children) that we introduced in Chapter 2. Why is this resolution so important? Because educators need to recognize that focusing on the child at the center of the curriculum is the necessary strategy to support children's ongoing development and learning. We know that during early childhood, children's de-

velopment generally progresses in several dimensions in predictable ways: movement from simple to complex, concrete to abstract, egocentric to perspective taking, linear to multidimensional, direct observation and experience to vicarious experience (Kostelnik, Soderman, & Whiren 1993). As a result, much of early childhood curriculum involves concepts that are simple, concrete, egocentric, linear, and based on direct experience—not to limit children to these types of experiences but because our goal is to move children's thinking to become more complex, abstract, perspective taking, multidimensional, and vicarious. In incremental ways, through adults' scaffolding children's learning and accepting children's unique models of understanding instead of requiring the adult version, children learn to accept, modify, or reject their own hypotheses about how the world works.

That early childhood educators begin "where children are," so to speak, does not mean we leave them there. This process of supporting children's construction of knowledge becomes apparent in studying documentation of project work in Reggio Emilia, where teachers help children embellish their representations or models of concepts so that teachers can get a deeper, richer picture of what children understand and can support them as their thinking evolves. For example, when children at La Villetta School (Gambetti 1994) wanted to build a waterwheel for their Amusement Park for the Birds (described on p. 174), the children first drew pictures of waterwheels on paper. In these drawings, the paddles of the wheel faced forward rather than sideways as on a real paddlewheel. Instead of simply correcting the children's representations, the teachers offered other media, such as clay, for children to use to construct three-dimensional models. Again, the children repeated the error of the forward-facing paddles, perhaps because their models were laying down on their side. Finally, one child thought to turn his construction-paper model upright and realized that the paddles on his model were placed incorrectly; he tore them off and retaped them going the right direction. With this understanding of the workings of a waterwheel, children then thought of many materials that could simulate paddles and settled on spoons for their outdoor construction. The Amusement Park for the Birds is an enchanting example of integrated curriculum from which much can be learned. Most important, educators can recognize in this example the power of representation as a tool for learning and the importance of the teachers' role in providing adequate support to maintain children's interest, not by solving the problems for children but by giving them the tools and support needed to engage in meaningful problem solving themselves.

Achieving such thoughtful outcomes depends to a large degree on seeing the potentials in all children. As Loris Malaguzzi, founder of the Reggio Emilia preschools, points out,

> All people—and I mean scholars, researchers, and teachers, who in any place have set themselves to study children seriously—have ended up discovering not so much the limits and weaknesses of children but rather their surprising and extraordinary strengths and capabilities linked with an inexhaustible need for expression and realization. (1993, 72)

As we worked with the chapter authors, we observed how difficult it is to keep the focus on the strengths and potentials of individual children as we hold up the learning goals of the subject-matter experts. We realize the limitations of trying to thoroughly address curriculum content in any one subject area within the confines of a single chapter; however, in areas in which standards are clear and strong, such as math and science, the standards can easily dominate our thinking. The one chapter of this book in which the emphasis is clearly on the personal histories of individual children is Chapter 11, addressing language and literacy—the area of the curriculum for which standards were still being developed as this book was written.

As early childhood educators look to the disciplines to help guide us about important and rich content to inform curriculum, let us not lose sight of our essential focus on children. Curriculum can be transformed if, and only if, we make important knowledge meaningful to individual children by respecting how they learn best and by adapting for their individual strengths, needs, and interests.

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# Information about NAEYC

## NAEYC is . . .

. . . a membership-supported organization of people committed to fostering the growth and development of children from birth through age 8. Membership is open to all who share a desire to serve and act on behalf of the needs and rights of young children.

## NAEYC provides . . .

. . . educational services and resources to adults who work with and for children, including

- ***Young Children, the*** journal for early childhood educators
- **Books, posters, brochures,** and **videos** to expand your knowledge and commitment to young children, with topics including infants, curriculum, research, discipline, teacher education, and parent involvement
- An **Annual Conference** that brings people from all over the country to share their expertise and advocate on behalf of children and families
- **Week of the Young Child** celebrations sponsored by NAEYC Affiliate Groups across the nation to call public attention to the needs and rights of children and families
- **Insurance plans** for individuals and programs
- **Public affairs** information for knowledgeable advocacy efforts at all levels of government and through the media
- The **National Academy of Early Childhood Programs,** a voluntary accreditation system for high-quality programs for children
- The **National Institute for Early Childhood Professional Development,** providing resources and services to improve professional preparation and development of early childhood educators
- The **Information Service,** a centralized source of information sharing, distribution, and collaboration

***For free information about membership, publications, or other NAEYC services . . .***

. . . call NAEYC at 202-232-8777 or 800-424-2460, or write to . . .

**National Association for the Education of Young Children**
**1509 16th Street, N.W.**
**Washington, DC 20036-1426**

Newly developed national curriculum standards in the various subject-matter disciplines are useful guidelines to inform the early childhood curriculum. But alone they are insufficient to transform curriculum. To help children reach their potentials as learners, early childhood educators must transform curriculum and assessment to convey important knowledge from the disciplines in meaningful ways, to reflect what is known about the developmental characteristics of young learners, and to attend to the specific needs and interests of individual children.

Volume 2 of *Reaching Potentials* builds on Volume 1 by elaborating several of the curriculum guidelines developed by NAEYC and NAECS/SDE, describing

- the content recommended by the disciplines as being the most important for children to know;
- realistic content goals that are attainable for children of different ages; and
- ways of making curriculum content meaningful for individual children.

*A*
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